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International Specialists in the Environment

MEMORANDUM

TO: Carolyn Douglas, EPA Region IX

FROM: Patty Cook, Ecology and Environment, Inc. JMJ for PC

DATE: June 28, 1993

SUBJECT: Completed Work, Work Assignment No. 20-18-9J00

CC: Lisa Nelson, Work Assignment Manager, H-8-1

Attached is the following completed:

PA___ SI X EPI PA___ PA Review___ SI Review___

NPL Prioritization___ SWIFT PA___ SWIFT SI___

Other____________________

Site Name: Buckeye Properties

EPA ID #: CAD982392243 (3675)

City, County: San Francisco, San Francisco

Latitude: 37°44'06" Longitude: 122°23'18"

FOR EPA USE ONLY

EPA Further Action Determination: NFRAP 9/14/93

Site Lead: Federal LWong

Sign Off Date: 8-31-93

Initials of: Site Assignment Manager LN

Document Screening Coordinator JMJ 9/13/93

[illegible] 9/13/93

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Purpose: CERCLA Site Inspection

Site: Buckeye Properties
1296 Armstrong Ave.
San Francisco, CA

Site EPA ID Number:	CAD982392243
Investigators:	James M. James
Date of Inspection:	February 3, 1993
Report Prepared By:	James M. James
Report Date:	June 14, 1993
E & E Review/Concurrence:	Patty Cook Patty Cook 6/23/93
Submitted To:	Carolyn Douglas EPA Region IX Site Assessment Manager

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1. INTRODUCTION

The U.S. Environmental Protection Agency (EPA), Region IX, under the authority of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA) has tasked Ecology and Environment, Inc., (E & E), to conduct a Site Inspection (SI) at the Buckeye Properties site in San Francisco, California.

Buckeye Properties was identified as a potential hazardous waste site and entered into the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) in July 1989. The owner of the property notified EPA following the City and County of San Francisco's discovery of contamination at the site (1). A Preliminary Assessment (PA) was performed for EPA in December 1990. The purpose of the PA was to review existing information on the site and its environs to assess the threat(s), if any, posed to public health, welfare, or the environment and to determine whether further investigation under CERCLA/SARA was warranted. After reviewing the PA, EPA decided that further investigation of the Buckeye Properties site would be necessary to more completely evaluate the site using EPA's Hazard Ranking System (HRS) criteria (2). The HRS assesses the relative threat associated with actual or potential releases of hazardous substances from the site. The HRS is the primary method of determining a site's eligibility for placement on EPA's National Priorities List (NPL). The NPL identifies sites at which EPA may conduct remedial response actions. This SI Report presents the results of EPA's recent investigation.

2. APPARENT PROBLEM

Metals and hydrocarbons contamination exists in the groundwater and soil beneath a portion of the Buckeye site (3,4). During construction of a sewer line under the site, an environmental assessment of excavations was conducted and revealed the contamination. The assessment was completed to meet the requirements of San Francisco's Maher Ordinance, which ensures that developers of properties within previously landfilled portions of the Bay complete hazardous waste investigations prior to project construction (4).

The contamination was reported in September 1989 to the Enforcement Section of EPA by an attorney for Buckeye Properties (1). In addition, a consultant for the California Parks and Recreation Department found metals and hydrocarbons in sediments in the South Basin Inlet adjacent to the site (5).

3. SITE DESCRIPTION

3.1 LOCATION

The Buckeye Properties site (Buckeye) comprises about 5 acres in southeast San Francisco, California (T. 2 S., R. 5 W., Mount Diablo Baseline and Meridian; lat. 37°44'06" N., long. 122°23'18" W.) (Figure 3-1). Buckeye is in an industrial area and bordered to the northeast by the South Basin Inlet, which empties into San Francisco Bay. Candlestick Point State Recreation Area borders the site to the southeast. Hunters Point Naval Shipyard, an NPL site, is about 800 feet east and northeast of the site (6,7,8).

3.2 SITE DESCRIPTION

To date, EPA has defined the site on the basis of the boundaries of properties owned by Buckeye Properties, Inc. The properties are on City Block 4845 and 4846, which are subdivided into many parcels (Figure 3-2) (9).

The Buckeye site covers tidal land that was reclaimed from San Francisco Bay between about 1943 and 1955; the majority of the fill material was in place by 1948 (3,9). The site is partially paved and fenced, and several large warehouses are present. Ten businesses occupy the site including Ranger Pipelines, City Debris, and a cabinet shop. The site is cluttered with disabled cars, engines, and miscellaneous debris as is much of the surrounding area (7,8).

Base map source: USGS 1:24000 San Francisco, CA quad

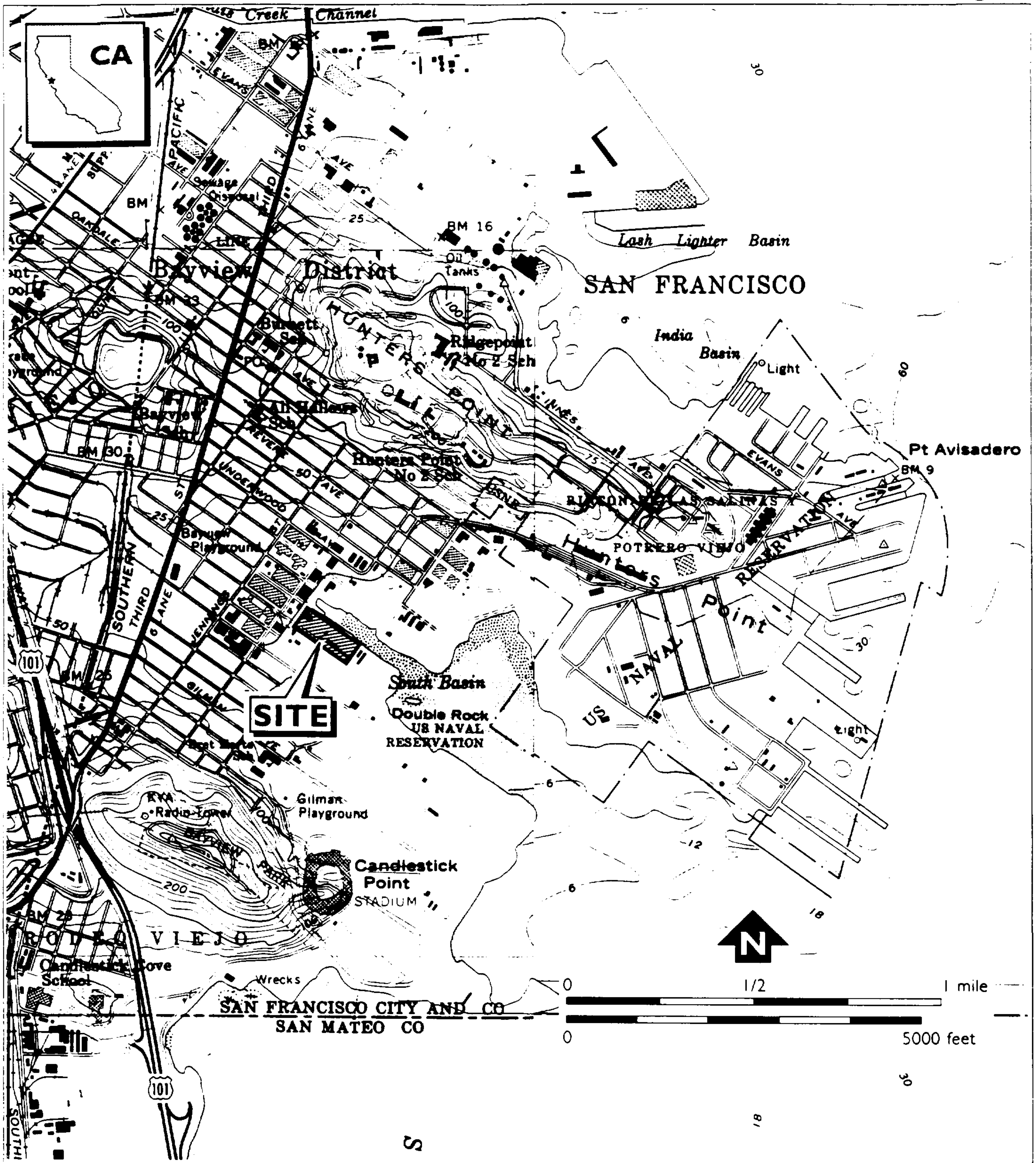

Figure 3-1

SITE LOCATION MAP

BUCKEYE PROPERTIES

1296 Armstrong Avenue

San Francisco, California

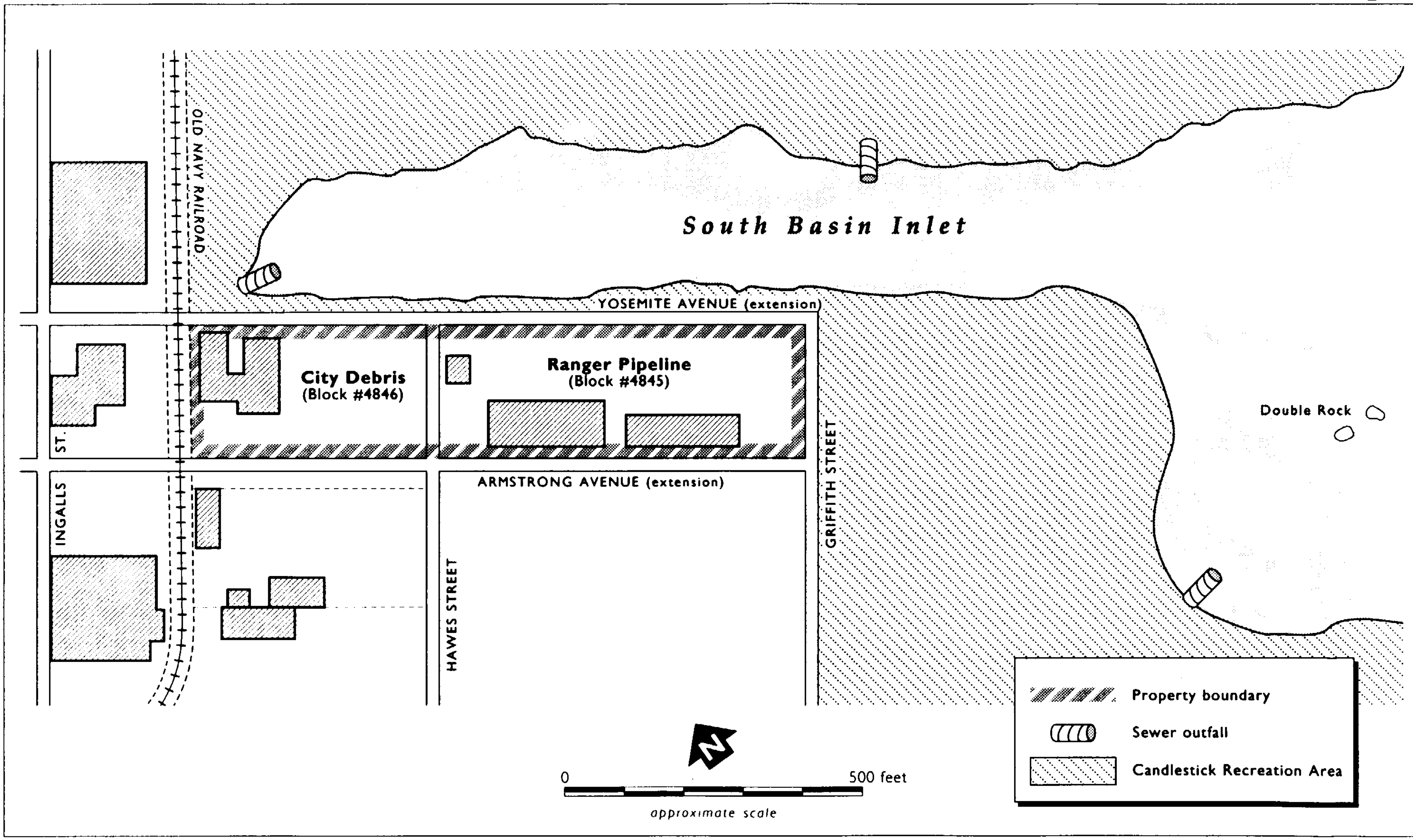

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Figure 3-2
FACILITY MAP
Buckeye Properties
1296 Armstrong Avenue
San Francisco, California

3.3 OPERATING HISTORY

Prior to 1942, about 80 percent of the site lay under the water of San Francisco Bay and there was no development on site (3,9,10,23). The surrounding area except for the shipyard was used primarily for agriculture. The first shipyard at Hunters Point was built in 1866 by private investors. It was expanded in 1903 and purchased by the Bethlehem Steel Company in 1908. The Bay View Park and Race Course was established in the 1860s southwest of the Buckeye site and operated as a horse racing track until the 1890s (11).

Development of the area between Hunters Point and Candlestick Point, 3,000 feet southwest of the site, accelerated with the onset of World War II. The Navy had used the shipyard since 1910 but did not own it until 1941 when the property was purchased from Bethlehem Steel. At that time, the shipyard covered about 50 acres. The Navy secured additional properties from the City of San Francisco and condemned properties owned by private individuals. By 1945, the Navy controlled almost 1,000 acres at Hunters Point. To supply the shipyard, the Navy constructed a rail spur that abuts the northwest side of the Buckeye site (3,11). Extensive Navy housing was north of the railroad tracks. A lumber yard that supplied the Navy was northwest of the site (3,10,23).

During and after World War II, much of the historic bay margin in the South Basin Inlet area was subjected to filling and dumping (11,12). According to one history of bay filling activities, much of the tidelands reclamation near South Basin Inlet was conducted to provide space for temporary housing for workers at the shipyard (11). Reportedly, the fill came from nearby hills (11,16). The City's 1986 investigation revealed that construction debris, waste oil, and miscellaneous military equipment were dumped at the site (4,12). A review of aerial photographs and parcel plot maps shows that, in 1948, the property was undeveloped and used for dumping (9,10). Many lifeboats are visible in the 1948 photograph in what appears to be a depression on site (10).

In 1954, Julio Ricci purchased Parcel 1 of Block 4845 and leased Parcel 2 of the same block from the State of California to expand operations of the Ricci & Kruse Lumber Company. The company was founded in 1875 by J. H. Kruse at a location on Shotwell Street in San Francisco. Although most of the site was filled by 1954, Mr. Ricci purchased some material to fill and level the southeastern part of the site (8,9). The lumber yard on Armstrong Avenue initially covered 3 acres and had 35,000 feet of warehouse space (13). In the mid1960s, Julio Ricci purchased several parcels of Block 4846 and expanded the lumber yard (8).

On the basis of aerial photographs, other photographs and slides, home movies, and lumber yard invoices there is no indication that the yard was used for activities other than lumber storage from 1955 to 1986. Reginald Ricci, son of Julio Ricci, has stated that no wood treatment occurred on site. Reginald Ricci worked at the yard, later owned the business, and currently owns the property (8,39).

Current tenants at the site include Ranger Pipelines, City Debris, and a cabinet shop. Ranger Pipelines installs pipelines and uses the site to store materials. City Debris receives construction debris for wood reclamation. The wood is sorted out of the debris and fed into a wood chipper. The wood chips are shipped off site for use at cogeneration plants. While the site is cluttered with cars, car parts, and construction debris, there are few active sources of waste hazardous substances (7,8).

3.4 REGULATORY INVOLVEMENT

Neither the California Department of Toxic Substances Control (DTSC) nor the California Regional Water Quality Control Board (RWQCB) are involved with Buckeye (14,15,18,38). San Francisco's Department of Public Works (DPW) was involved with the site during construction of the storm sewer outfall in the mid1980s (4,12). Buckeye was not listed in the RCRA database as of November 16, 1990, nor in the January 1990 update of the California Expenditure Plan for the Hazardous Substances Cleanup Bond Act of 1984.

The Navy is conducting evaluations of the railroad right-of-way on the northwest property line. These evaluations, however, appear to focus on areas northeast of the site near the Hunters Point Naval Shipyard (16,17).

4. INVESTIGATIVE EFFORTS

4.1 PREVIOUS SAMPLING

The City of San Francisco completed an environmental assessment of the site area in 1986 to meet the requirements of San Francisco's Maher Ordinance, which ensures that developers of properties within previously landfilled portions of the Bay complete hazardous waste investigations (4,12). Sampling was performed and contamination was found in the groundwater and soil beneath a portion of the site (Section 5) (4). The City attributes the contamination to filling and dumping activities during and after World War II (12).

Environmental investigations of areas surrounding the South Basin Inlet were performed on behalf of the California Department of Parks and Recreation in 1989. Soil gas samples, subsurface soil samples, and groundwater samples were collected along the northeastern side of the property, and sediment samples were collected from the inlet. The soil gas analyses were not analyte-specific. Hazardous substances were found in sediments adjacent to the site (5).

The contamination problem was reported in September 1989 to the Enforcement Section of EPA by an attorney for Buckeye Properties (1). EPA completed a preliminary assessment of the site in 1990 and determined that further investigations were warranted (2).

4.2 EPA SAMPLING

Because of the existence of previous sampling data, the lack of defined wastes sources associated with on-site activities, and the presence of off-site sources of contamination, EPA did not conduct sampling at this site as part of this investigation.

5. HAZARD RANKING SYSTEM FACTORS

5.1 SOURCES OF CONTAMINATION

Except for materials that were deposited as fill at this site when tidal areas were reclaimed, there are few known potential sources of waste hazardous substances (8,39). During excavation for the sewer project, a variety of materials were found including railcar carriages, canteens, drums, and steel cables. Pools of material that smelled like creosote were also present in the excavations. A newspaper found in the excavation was dated 1942 (4,8,12). Because filling along the South Basin Inlet was unregulated, the extent of potential contamination is unknown and likely to be widespread.

From 1955 to 1986, the site was reportedly used exclusively for lumber storage and a small cabinet shop (8,39). Currently, disabled cars and car engines on site may be sources of used oils, antifreeze, and batteries (8).

Investigations by the City from 1986 to 1989 revealed that contamination beneath the site contains metals and hydrocarbons. Table 5-1 summarizes the analyses of the waste. Photographs of the excavations indicate that visible contamination is not present within the first 2 feet below ground surface (bgs). Although the contamination is not contained by manmade structures, it is likely that vertical contaminant migration is impeded by bay mud that is encoutered about 15 feet bgs. The lateral extent of the contamination is not known, but contamination of fill is widespread in San Francisco. Some of the wastes were removed during construction of the sewer pipe. Table 5-2 summarizes the analyses of on-site and near-site soils. Table 5-3 summarizes the off-site analyses. Figure 5-1 shows the sampling locations (4,5).

In many of the soil samples collected on or adjacent to the site, the metals concentrations appear to be above naturally occurring levels. With the exception of the sample collected from Location 7i, however, the

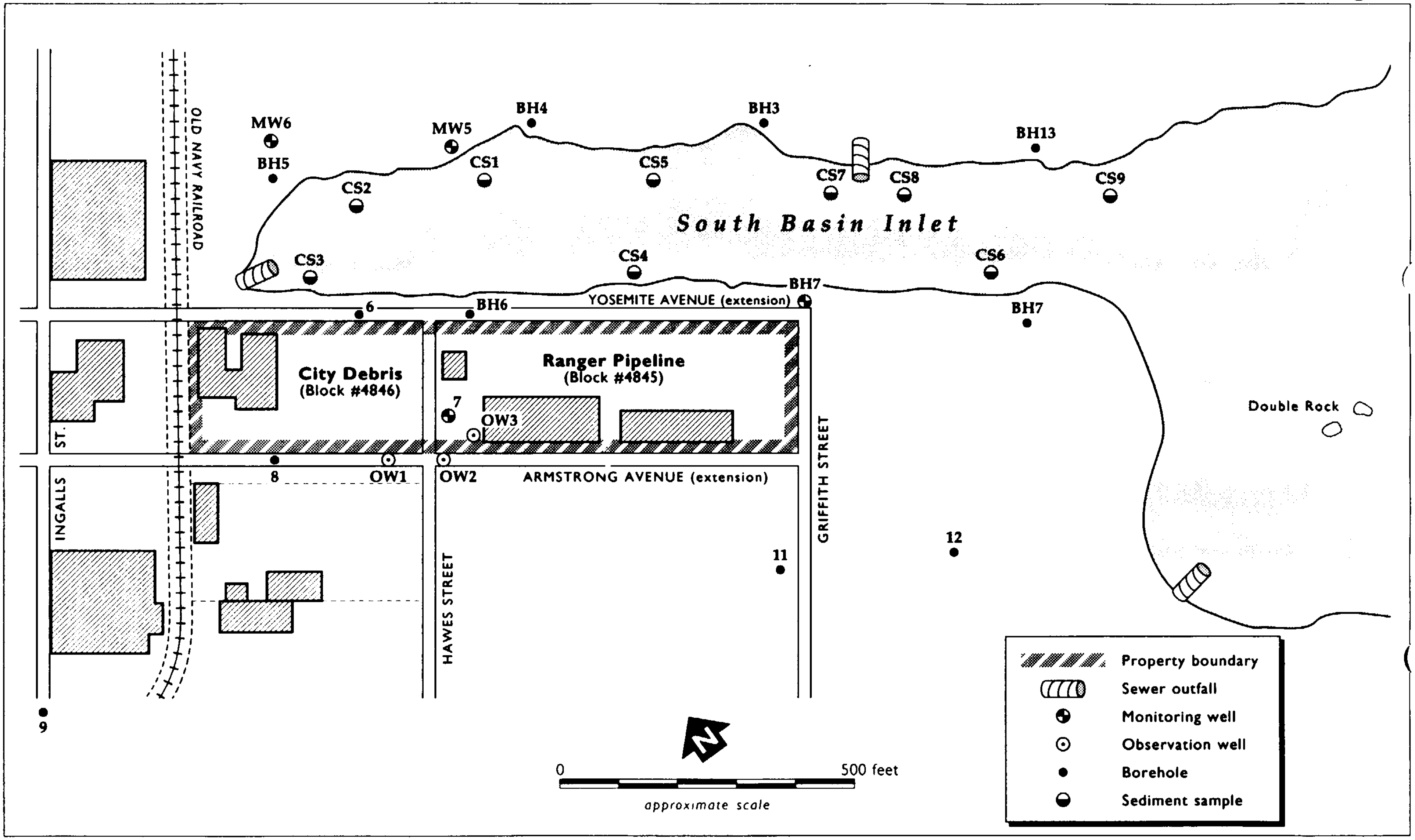

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Figure 5-1

SAMPLE LOCATIONS MAP

Buckeye Properties

1296 Armstrong Avenue

San Francisco, California

Table 5-1

Waste Material Analyses

Concentration (mg/kg)

Sampling Location*

Analyte	OW1	OW2	OW3
Acenapthylene	48	<10	5,400
Anthracene	40	25	<2,000
Chrysene	15	<10	<2,000
Flouranthene	58	33	4,100
Flourene	18	17	<2,000
Naphthalene	210	180	48,000
Phenanthrene	150	88	11,000
Pyrene	100	81	<2,000
TPH	460	1,400	470,000

Reference: 4.
* Sampling location are shown on Figure 5-1.

Table 5-2

On-Site Subsurface Soil Analyses

Concentration (mg/kg)

Sampling Location*

Analyte	6	7	7i	8	BH6	MW4
Creosote	NA	<10	NA	<10	NA	NA
Pentachlorophenol	NA	<10	NA	<10	NA	NA
PCBs	<0.1	<0.1	NA	<0.1	NA	NA
Cyanide	<0.2	<0.2	NA	<0.2	NA	NA
Cadmium	0.4	0.7	**12**	0.2	NA	NA
Chromium	44	50	43	44	37	210
Copper	19	94	**440**	64	20	45
Lead	11	76	230	13	160	10
Nickel	49	46	140	28	58	380
Zinc	44	180	**7,400**	35	NA	NA
Mercury	0.012	0.020	0.023	0.039	NA	NA
Tetrachloroethene	<0.05	NA	NA	NA	<0.005	<0.005
1,2-Dichloroethene	<0.05	NA	NA	NA	NA	NA
Benzene	<0.05	NA	NA	**0.66**	<0.005	<0.005
Toluene	**1.3**	NA	NA	<0.05	NA	NA
Chlorobenzene	<0.05	NA	NA	<0.05	NA	NA
1,3-Dichlorobenzene	<0.05	NA	NA	<0.05	NA	NA
Ethyl benzene	<0.05	NA	NA	<0.05	<0.005	0.005
TPH	NA	NA	NA	NA	<5	57

Reference: 4,5.
* - Sampling location are shown on Figure 5-1.
NA = Not Analyzed.
Boldface = Indicates concentrations 3 or more times background.

Table 5-3

Off-site Subsurface Soil Analyses

Concentration (mg/kg)

Sampling Location*

Contaminant	9	11	12	BH3	BH4	BH5	Mean	Range
Creosote	NA	NA	NA	NA	NA	NA	NA	NA
Pentachlorophenol	NA	NA	NA	NA	NA	NA	NA	NA
PCBs	<0.1	<0.1	<0.1	NA	NA	NA	<0.1	<0.1
Cyanide	<0.2	<0.2	<0.2	NA	NA	NA	<0.2	<0.2
Cadmium	<0.2	<0.2	1.8	NA	NA	NA	0.6	<0.2-1.8
Chromium	94	320	46	86	33	24	100	24-320
Copper	18	29	62	330	22	10	78	10-330
Lead	11	30	740	230	120	130	210	11-740
Nickel	50	490	41	480	140	16	203	16-490
Zinc	37	72	390	NA	NA	NA	166	37-390
Mercury	0.054	0.071	0.067	NA	NA	NA	0.064	.054-.71
Tetrachloroethene	0.38	<0.05	<0.05	<0.005	<0.005	<0.005	.06	<.005-.38
1,2-Dichloroethene	<0.05	<0.05	0.26	NA	NA	NA	.09	<.05-.26
Benzene	0.11	<0.05	<0.05	<0.005	<0.005	<0.005	.02	<.005-.11
Toluene	0.89	<0.30	<0.05	NA	NA	NA	0.40	<.05-.89
Chlorobenzene	<0.05	3.3	0.31	NA	NA	NA	1.2	<.05-3.3
1,3-Dichlorobenzene	<0.05	1.5	NA	NA	NA	NA	0.50	<.05-1.5
Ethyl benzene	<0.05	1.0	<0.05	<0.005	<0.005	<0.005	.17	<.005-1.0
TPH	NA	NA	NA	260	2,500	72	944	15-2,500

Reference: 4,5.
* - Sampling location are shown on Figure 5-1.
NA = Not Analyzed.

metals concentrations are not significantly greater than the levels found in off-site samples. Notably, the sample from Location 7i was a grab sample whereas the samples from Locations 6, 7, 8, 9, 11, and 12 were composite samples. Relatively few samples were analyzed for organic contaminants; only benzene and toluene are reported at elevated levels (4). On the basis of the data collected to date, the soils contamination is not unique to the site and may be somewhat ubiquitous in bay fill (4,5,12,15,16,37).

In 1986, one 1,000-gallon and one 2,000-gallon underground tank used to store gasoline were removed from the site. During their removal, a hole was noted in one of the tanks. Soil and shallow groundwater were analyzed and found to be contaminated with hydrocarbons as total petroleum hydrocarbons (TPH) at levels of up to 500 and 100 parts per million (ppm), respectively (19). These tanks are not hazardous substance sources because gasoline is excluded from consideration as a hazardous substance under CERCLA. No further investigation or remediation of the contamination was performed (8).

5.2 GROUNDWATER PATHWAY

5.2.1 Hydrogeologic Setting

Groundwater beneath the site is first encountered approximately 4 feet bgs. The groundwater gradient appears to be heavily influenced by tides. Dense bay mud underlies the shallow groundwater, which is contaminated by hydrocarbons and metals (5). The contamination likely originates from off-site sources as well as subsurface on-site sources. Table 5-4 summarizes the available groundwater data. Sampling Location 7A was near an area of subsurface contamination (4,5).

Information on groundwater quality is limited; no comprehensive sampling has been done. Additionally, it should be noted that the sample from Location 7A was collected in 1986, but samples from Wells MW4, MW5, and MW6 were collected in 1989 (4,5).

Table 5-4

Groundwater Analyses

Concentration (mg/l)

Sampling Location*

Analyte	7A	MW4	MW5	MW6	MCL
Chromium	NA	0.09	0.019	0.06	0.1
Copper	NA	0.09	<0.05	0.17	1.3
Lead	NA	**0.20**	<0.005	0.020	0.05 (CA)
Nickel	NA	0.19	0.08	0.29	0.1
Mercury	NA	<0.001	<0.001	<0.001	0.002
1,1-Dichloroethene	**0.17**	<0.005	<0.005	<0.005	0.005(CA)
Benzene	**0.80**	<0.005	<0.005	<0.005	0.005
Toluene	**0.14**	<0.005	<0.005	<0.005	1.000
Ethyl benzene	**1.00**	<0.005	<0.005	<0.005	0.700
Xylenes	**1.2**	<0.005	<0.005	<0.005	10
TPH	**680**	<1	1	<1	NA

Reference: 4,5.
* - Sampling location are shown on Figure 5-1.
NA = Not Analyzed.
Boldface = Indicates concentrations 3 or more times background.
CA = California state action level.

The concentration of lead in the sample from Location MW4 is elevated relative to locations MW5 and MW6 and the EPA maximum contaminant level (MCL). The analysis, however, was performed on an unfiltered sample and is not strictly comparable to MCLs. The grab sample from Location 7A was collected from an open borehole rather than a monitoring well, and it is not known whether the concentrations of organic chemicals in the sample are representative of the local groundwater or some mixture of liquid wastes and water (4). Most of the contaminants reported in the sample may also be associated with leaking underground fuel tanks. Fuel storage tanks were present at Buckeye and nearby properties (19,20,38).

5.2.2 Groundwater Targets

The Albion Water Company (Albion) taps a spring located at 895 Innes Avenue about 1 mile northeast of Buckeye. Geologists have suggested that the water is from a deep and distant source; there is only bedrock beneath the area. Albion serves about 5,000 customers, although some of them are provided purified water from a municipal water source rather than the spring. The spring water is tested annually for Title 22 metals, organics, and coliform, and there have been no problems. There are other springs in the area, but no one uses them (16,41).

There is no other drinking water use of groundwater within 4 miles of the site because the water is generally saline (5,21,22).

5.2.3 Groundwater Pathway Conclusion

Although shallow groundwater is contaminated by metals and hydrocarbons, low-permeability bay muds underlie the site and nearby groundwater use is limited.

5.3 SURFACE WATER PATHWAY

5.3.1 Hydrologic Setting

The site is adjacent to the South Basin Inlet, which opens into San Francisco Bay (6,8). Tides influence the groundwater level and gradient (5). In addition to surface water runoff from the site and the migration of groundwater to the South Basin Inlet, three City of San Francisco stormwater overflows are nearby (8,23,24,40). Prior to 1988, these overflows discharged untreated sewage when it rained, 50 to 60 times per year. The sewage contained industrial wastewaters as well as domestic sewage (24,40).

In 1989 the California Parks and Recreation Department sampled sediments in the South Basin Inlet. Analyses of sediments from the inlet revealed the presence of metals and TPH (5). Table 5-5 summarizes the results. The levels of metals in samples from Locations CS3 and CS4 adjacent to the site were not significantly greater than the levels in most other sediment samples from the inlet. The concentration of TPH in Sample CS4 was, however, greater than the average concentration found nearby (5).

As part of the National Oceanic and Atmospheric Administration's (NOAA) National Status and Trends Program, the effects of contaminants on the environment has been evaluated for San Francisco Bay. NOAA calculated apparent effects thresholds (AETs) to estimate the sediment concentration above which statistically significant biological effects are expected. The AETs for chromium (280 to 370 ppm), copper (110 to 180 ppm), lead (120 to 140 ppm), and nickel (greater than 170 ppm) are generally greater than the concentrations of these metals found in sediments immediately adjacent to the site. It is important to note that effects may, however, occur at concentrations below the AETs (5,35).

Regionally, from Islais Creek Channel 2 miles north of the site to Oyster Point 4 miles south of the site, the reported concentrations of contaminants in bay sediments vary considerably. TPH levels range from

Table 5-5

Surface Water Sediment Analyses

Concentration (mg/kg)

Sampling Location*

Contaminant	CS3	CS4	CS1	CS2	CS5	CS6	CS7	CS8	CS9
Chromium	27	42	41	250	48	680	65	14	90
Copper	17	34	22	76	110	140	170	95	74
Lead	29	140	1,300	420	470	420	170	200	210
Nickel	21	28	180	37	56	550	62	35	41
TPH	68	990	98	1,200	660	360	280	960	1,300

Reference: 5.
* - Sampling location are shown on Figure 5-1.

708 to 31,000 ppm; chromium levels range from 78 to 740 ppm; copper levels range from 10 to 1,754 ppm; lead levels range from 30 to 1,300 ppm; and nickel levels range from 48 to 430 ppm. The highest concentrations of these contaminants are generally found within Islais Creek Channel and near Hunters Point (25,26). Historically, Islais Creek Channel received wastewaters from the City of San Francisco's sewage treatment plant, and Hunters Point has been the site of intensive industrial activity (11,26).

Because of the proximity of the site to the inlet, the contamination of groundwater, and the known communication between groundwater and surface water, it is likely that contaminants beneath the site have migrated to surface-water sediments (4,5,6). A sole source of this contamination can not be determined, however. Historic and current surface runoff from the industrial areas surrounding the site likely contains similar contaminants. These contaminants are common in sediments throughout the Bay. An appropriate reference for the levels found at the site is, therefore, not easily established (5,15,16,24,25,26,27,28,29,37).

5.3.2 Surface Water Targets

San Francisco Bay is used for fishing and boating. It supports herring, salmon, halibut, and clam fisheries. There are also several endangered or threatened species in the area including the California clapper rail, the California least tern, the California brown pelican, the burrowing owl, and the salt marsh harvest mouse (30,31,32,33,34,36). San Francisco Bay is not used for drinking water.

5.3.3 Surface Water Pathway Conclusion

Although sediment contamination is present in the South Basin Inlet adjacent to the site, the levels of contamination are not significantly greater than the levels in many other nearby and regional areas. There are other potential sources of the contamination including City sewer outfalls.

5.4 SOIL EXPOSURE AND AIR PATHWAY

Metals and hydrocarbons contamination at the site is primarily limited to the subsurface. The site is fenced and partially paved. There are several businesses on site but no residences. The surrounding area is primarily light industrial, and the nearest residences are about 1,000 feet north of the site (4,5,6,7,8).

6. EMERGENCY RESPONSE CONSIDERATIONS

The National Contingency Plan [40 CFR 300.415(b)(2)] authorizes the Environmental Protection Agency to consider emergency response actions at those sites which pose an imminent threat to human health or the environment. For the following reasons a referral to Region IX's Emergency Response Section does not appear to be necessary:

- Contamination appears to be inaccessible to the public;
- Groundwater use is limited and surface water is not used for drinking water.

7. SUMMARY OF HRS CONSIDERATIONS

The Buckeye Properties site (Buckeye) is about 5 acres in an industrial area in southeast San Francisco, California. It is bordered to the northeast by the South Basin Inlet, which empties into San Francisco Bay. Prior to the 1940s, much of the site was under the Bay. Tidal areas were reclaimed in the South Basin area during the 1940s. From 1954 to 1986, the site was a lumber yard. There is no information to indicate that the facility ever treated wood on site, and the known potential sources of hazardous substances on site are limited to disabled cars and engines and the bay fill itself.

Metals and hydrocarbons contamination exists in the groundwater and soil beneath the Buckeye site. During construction of a sewer line under the site, an environmental assessment revealed the contamination, which was reported to the Enforcement Section of EPA in September 1989 by an attorney for Buckeye Properties. In addition, a consultant for the California Department of Parks and Recreation found metals and hydrocarbons in surface-water sediments in the South Basin Inlet adjacent to the site. No state or local agencies are involved with the site. Contamination of fill materials and sediments is widespread in San Francisco.

The pertinent Hazard Ranking System factors for the site are as follows:

- Contaminants beneath the site have not been associated with any on-site activities and are likely associated with the bay fill;
- Groundwater use is limited, and the site is fenced and partially paved;
- Although sediments are contaminated, the contamination cannot be attributed to the site at this time because there are numerous potential off-site sources and appropriate reference contaminant levels have not been established.

REMEDIAL SITE ASSESSMENT DECISION - EPA REGION IX

Site Name: Buckeye Properties **EPA ID#:** CAD982392243

Alias Site Names: N/A

City: San Francisco **County or Parish:** San Francisco **State:** CA

Refer to Report Dated: 6/14/93 **Report type:** Screening Site Inspection

Report developed by: Ecology and Environment, Inc.

DECISION:

| | **1. Further Remedial Site Assessment under CERCLA (Superfund) is not required because:**

|X| 1a. Site does not qualify for further remedial site assessment under CERCLA (Site Evaluation Accomplished - SEA)

| | 1b. Site may qualify for further action, but is deferred to: | | RCRA | | NRC

| | **2. Further Assessment Needed Under CERCLA:** 2a. (optional) Priority: | | Higher | | Lower

2b. Activity Type: | | PA | | SI | | ESI | | HRS evaluation

| | Other:

DISCUSSION/RATIONALE:

Report Reviewed and Approved by: Lisa Nelson **Signature:** [signature] **Date:** 8-31-93

Site Decision Made by: Lisa Nelson **Signature:** [signature] **Date:** 8-31-93

EPA Form # 9100-3

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ecology and environment

9. REFERENCES

1. Amen, Thomas, Amen, Keith, & Berg, to Julie Anderson, Environmental Protection Agency (EPA), letter, September 18, 1989.

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APPENDIX A

CONTACT LOG AND REPORTS

CONTACT LOG

Facility Name: Buckeye Properties
Facility ID: CAD982392243

Name	Affiliation	Phone #	Date	Information
Thomas Amen	Law Firm	415-433-1790	8/9/90	See Contact Report
Chuck Flippo	EPA	415-744-1996	8/21/90 9/14/90	See Contact Report
Jennifer Eberle	E & E FIT	415-777-2811	8/22/90, 9/20/90	See Site Drive-By Report
Paul Riley	California Dept. of Fish and Game	415-688-6362	8/27/90	See Contact Report
Carlos Hernandez	US Army Corps of Engineers	415-744-3359	8/27/90	Site is in 500-year floodplain.
Harold Coffee	City of San Francisco	415-550-2750	8/29/90, 9/6/90	See Contact Report
Bea Atkins	SF Envir. Health	415-554-2775	9/6/90	No agency involvement with Buckeye Properties
Tom Gandesberry	RWQCB	415-464-1255	9/10/90	No agency involvement with Buckeye Properties
Doris Cruz	DHS	415-540-3800	9/11/90	No agency involvement with Buckeye Properties
Paul La Courreye	EPA	415-744-1914	9/13/90	See Contact Report
Dien Nguyen	City Debris	415-822-3334	9/21/90	See Contact Report
Scott Hamlin Gus Yates	USGS	916-978-4648	10/2/90	See Contact Report
Lois O'Connor	City of Brisbane	415-467-1515	10/2/90	See Contact Report
Paul Riley	California Dept. Fish and Game	415-688-6362	3/5/91	He does not know whether there has been clamming in the South Basin Inlet. Contact Fred Nichols at USGS for further information.

Margaret Gabil	Candlestick Point State Recreation Area	415-557-4069	3/6/91, 3/14/91, 4/25/91	See Contact Report
Carolyn Douglas	U.S. EPA	415-744-2343	3/7/91	Ms. Douglas is working with Jim Quint, who is the Site Assessment Manager for Buckeye Properties. We set a meeting for 11:00 am on March 13th to discuss the site boundaries.
Chuck Flippo	U.S. EPA	415-744-2388	3/14/91	Mr. Flippo will send FIT a map showing what the Navy considers to be under their environmental restoration scope.
Joanne Knight	California Dept. of Health Services (DHS)	415-540-3739	3/14/91	There is no project manager for the site. Written request must be made for a file search.
Doris Cruz	DHS File Room	415-540-3800	3/15/91	There are no files for Buckeye Properties.
Duty Officer	RWQCB	415-464-1255	3/18/91	FIT must come into the file room to check for files.
Ken Gray	California Dept. of Parks & Recreation	408-649-2862	3/18/91	See Contact Report
Steve Krival	DHS	415-540-3841	3/18/91	See Contact Report
Jan Anderson	Audubon Society	415-882-3374	3/19/91	There are no threatened or endangered species in the area. Migratory shore birds feed in the canal at low tide, and waterfowl feed during high tide. The canal is a tidal wetland.

Steve Zembsch	California Dept. of Parks & Recreation	408-649-7115	3/19/91	See Contact Report
Fred Nichols	USGS	415-329-4411	4/1/91	See Contact Report
Mike Thabault	National Marine Fisheries Office	707-578-7513	4/3/91	Since they do not manage fisheries within state waters, he does not know whether clams are harvested in Yosemite Canal.
Tom Gandesbery	RWQCB	415-464-0841	4/23/91	Buckeye is not in RWQCB's case files. Brush and Sons Lumber Co. at 1313 Armstrong Avenue is listed in RWQCB's fuel leak files. This means that they are at least suspected of having a UST fuel leak. He'll check the Land Disposal files for FIT.
Barbara Ratti	San Francisco Envir. Health	415-554-2775	4/24/91	There is no file for Buckeye (the landfill), but there is a file for a business at 1313 Armstrong Avenue called E.S. Brush and Sons Co. This business filed for a Hazardous Materials Permit.
Matt McCarron	DTSC		08/20/92	DTSC is not active at the Yosemite Pump Station site. Contact Don Cox's group at 540-3804 for more information.
Len Miller	DTSC	510-540-3803	08/25/92	See Contact Report
Steven Low	City and County SF	415-554-2789	08/26/92	See Contact Report
Pam Hollis	City and County SF	415-554-2792	09/11/92	See Contact Report
Martha Bodden	MITRE Corp.	703-883-7667	11/12/92	See Contact Report
Chris Phanartzis	City Dept. Public Works (DPW)	415-431-9430	01/27/93	See Contact Report

Roberta Blank	US EPA RPM Hunters Point	415-744-2385	01/28/93	Ms. Blank referred me to Wing Wong of the Navy and Bonnie Arthur of DTSC for information regarding Hunters Point.
Bonnie Arthur	CAL-EPA DTSC	510-540-3739	01/28/93	Ms. Arthur suggested that the Navy's contractor would be presenting new ecological data soon. Bobbie Smith is the RWQCB contact for Hunters Point.
Bobbie Smith	CAL-EPA RWQCB	510-286-4222	01/28/93	RWQCB is aware of off-base areas of contamination related to Hunters Point and may consider expanding the current Hunters Point boundaries.
Jim Salerno	DPW	415-648-6882	01/28/93	See Contact Report
Wing Wong	US Navy	415-244-2537	01/28/93	PA-52 was an area of study located along the railroad right-of-way. Mr. Carl Michelson of Harding Lawson Associates (415-899-7358) has more details regarding that work. Larry Burkmoser of the US Army Corps of Engineers (916) 557-7671 may also be aware of off-site areas.
Carl Michelson	Harding Lawson	415-899-7358	01/28/93 06/15/93	See Contact Report
Reginald Ricci	Buckeye Properties	415-435-4740	01/28/93	See Contact Report
Steve Mollinax	DPW	415-774-4166	02/22/93	See Contact Report
Micheal Mee	Albion Water Co.	415-821-3444	06/15/93	See Contact Report

SITE DRIVE-BY AND OBSERVATIONS REPORT

Ecology and Environment, Inc.
Field Investigation Team (FIT)
160 Spear Street, Suite 1400
San Francisco, California 94105
(415) 777-2811
E & E PERSON(S) CONDUCTING DRIVE-BY AND MAKING OBSERVATIONS:
Jennifer Eberle & Janet Kaps (8/22); Jennifer Eberle & Paul Brown (9/20)

SITE NAME: Buckeye Properties	**DATE:** 8/22/90, 9/20/90
CITY/STATE: San Francisco, California	**EPA ID#:** CAD982392243

The following information was obtained during the drive-by:

A worker at one of the trucking companies (corner of Hawes St. and Yosemite Ave.) told us his company does demolition and hauling work, and that all their waste oil is hauled off site. He said their operation had been at this location for approximately one year. He declined to identify himself.

A secretary at Ranger Pipelines told us that install underground pipelines. They produce no hazardous wastes, and their operation has been at this location for approximatley 1.5 Ranger Pipelines years. She also pointed out a trailer across Armstrong Ave. (with a 14-foot fence around it) in which somebody lives.

The following observations were made during the drive-by:

A site plan showing approximate locations of lessees was drawn up (see Fig. 2 in the Preliminary Assessment). An on-site trailer residence was noted southwest of Armstrong Ave. The area southeast of "Griffith St." is vacant, overgrown with vegetation and teaming with birdlife. This area is raised up approximately 8 feet higher than the Buckeye Properties site. Along the water's edge off Yosemite Ave. extension are rusted drums, scrap metal, construction debris, wood and poured concrete, and/or asphalt. Various trucks and buses were also found on Yosemite Ave. extension, as well as in the area of the trailer residence. Approximately 25 percent of the entire site is paved with asphalt and/or buildings. The remainder is exposed soil with or without vegetation. There is no apparent contamination at the ground surface.

je/bp/recon

SITE RECONNAISSANCE INTERVIEW AND OBSERVATIONS REPORT

Ecology and Environment, Inc.		
160 Spear Street, Suite 1400		
San Francisco, California 94105		
(415) 777-2811		
E & E PERSON(S) CONDUCTING INTERVIEW: James M. James		
FACILITY REPRESENTATIVE(S):	**TITLE:**	**PHONE:**
Reginald Ricci	Property Owner	415-435-4740
SITE NAME: Buckeye Properties		**DATE:** 2/3/93
CITY/STATE: San Francisco, CA		**EPA ID#:** CAD982392243

The following information was obtained during the interview:

E & E met Mr. Ricci at his residence in Belvedere, California, on February 3, 1993, to discuss the site history and review Mr. Ricci's records.

Mr. Ricci described the development of his family's interest in the site as follows. Mr. Ricci's father bought Lot 1 of 3 of Block 4845 in 1954, and Lot 2 of 3 was leased from the state at that time. Some of Lot 1 was still under water and imported fill was purchased and delivered to the site (Mr. Ricci produced receipts for the purchased fill). Lots 1, 2, 3, 13, and 16 of Block 4846 were purchased in the 1960s.

The family's wholesale lumberyard occupied Block 4845 from 1955 to 1986. The lumber yard expanded to occupy portions of Block 4846 until 1986. A cabinet shop also operated on a portion of Lot 13 of Block 4846. The lumberyard used delivery trucks and a fork lift, but maintenance of the vehicles was probably performed off site. Lumber yard activities ceased in 1986.

Mr. Ricci provided 8-mm home movies showing the site in the mid 1950s when construction of the lumber yard began. There is no indication of wood treatment or waste disposal activities at the site. It appears to be clean and orderly. A review of Mr. Ricci's photographic slides similarly did not indicate wood treatment or waste disposal activities.

Mr. Ricci presented invoices used by the company to bill customers and several company calendars from the late 1950s and early 1960s. The materials indicate that the site was used for the storage of lumber only.

A review of aerial photographs acquired by Mr. Ricci indicates that most of the site was underwater prior to 1939. Through 1953, the site remained undeveloped although filling of the area appeared to be nearly complete by 1946. A dark spot on Block 4845 is apparent in a photo from 1951. A 1948 photo appears to show a surface depression surrounded by life rafts along Armstrong, between Ingalls and Hawes. The aerial photos do not indicate the presence of tanks or surface impoundments as might be associated with wood treatment.

A real estate broker operating as a master lessor then leased the property to a variety of businesses, including San Francisco Container, the cabinet shop, and a scrap wood recycler.

Historically, other industries in the area included a tannery located across the channel, Brush Lumber, which stored treated lumber for the Port of San Francisco, and Schraeder Lumber, which stored pre-treated railroad ties.

Mr. Ricci first became aware of the contamination when the City of San Francisco began excavations adjacent to his property in the late 1980s. In 1986, the City sent Mr. Ricci a letter regarding upgrading sewer facilities near the site. When the excavations were begun, the realty company, acting as a master lessor for Mr. Ricci, expressed concerns that the City's work was limiting access to the site. These preliminary concerns were soon over-shadowed by the presence of wastes in the subsurface.

No remediation was conducted regarding the removal underground fuel tanks in 1986.

The following observations were made during the site visit:

James M. James and Peter M. Geiger of E & E conducted a site visit with Mr. Ricci on February 5, 1993. The site is adjacent to the South Basin Inlet in an industrial area of southeast San Francisco. A railroad right-of-way, not in use, is on the northern border of the site. The area surrounding the site is covered with litter, and a leaking drum that appeared to contain oil near the railroad tracks. Sewage overflow outfalls were visible adjacent to the site along Yosemite between Ingalls and Hawes streets and across the South Basin Inlet.

The site is mostly paved and fenced. The primary activity appears to be scrap wood recycling. Scrap wood is delivered in large roll-off bins and trucks, is sorted, and then fed into a wood chipper. The processed wood material is then transported off site. The site was <u>not</u> orderly. There were disabled automobiles, engines, and debris among the wood materials. There are no on-site residents.

CONTACT REPORT

AGENCY/AFFILIATION: Amen, Keith & Berg, P.C.		
DEPARTMENT: Law Offices		
ADDRESS/CITY: 847 Sansome Street/SF		
COUNTY/STATE/ZIP: San Francisco/California/94111		
CONTACT(S)	**TITLE**	**PHONE**
1. Thomas Amen	Attorney	415-433-1790
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 8/9/90
SUBJECT: Background contacts		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Christopher French did an extensive report on the site characterization.

The City installed a monitoring well to address the Yosemite outfall (Clean Water Dept.)

Amen does not want to send me a copy of his files and would prefer that I come to his office to see what I would like copied.

CONTACT REPORT

AGENCY/AFFILIATION: EPA		
DEPARTMENT: Superfund		
ADDRESS/CITY: 1235 Mission Street/SF		
COUNTY/STATE/ZIP: San Francisco/California		
CONTACT(S)	**TITLE**	**PHONE**
1. Chuck Flippo	Remedial Project Manager	415-865-7630 h
2.		744-1996 w
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 8/21,9/14
SUBJECT: Hunters Point's relationship to the site		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

8/21/90

Hunters Point is on the NPL. There are lessees of Navy property. Buckeye Properties at 1296 Armstrong Avenue is not included in Hunters Point.

9/14/90

He studied French's report and was especially interested in the aerial photos, which reveal reclamation of the bay both at the site and at Hunters Point during the same time.

The Navy is afraid that contamination from surrounding businesses are coming into their property. Go ahead and write the PA report with references to the Navy.

CONTACT REPORT

AGENCY/AFFILIATION: State of California		
DEPARTMENT: Fish and Game		
ADDRESS/CITY: 411 Burgess Drive/Menlo Park		
COUNTY/STATE/ZIP: San Mateo/California/94025		
CONTACT(S)	**TITLE**	**PHONE**
1. Paul Riley	Associate Marine Biologist	688-6362
2. Alan Grover	Biologist	707-544-7452
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 8/27/90
SUBJECT: Fish catches in SF Bay		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Mr. Riley said the 15-mile target distance limit encompasses virtually the entire SF bay. The commercial herring fish catch is 9,500 tons (19,000,000 pounds) per year in San Francisco Bay.

There are 11 or 12 recreational clamming sites in the Bay. People collect Manila and Japanese little-neck clams for food, roughly 10,000 pounds per year. This information is based on a 1981 report of recreational clamming.

Mr. Grover said more salmon are caught by sport fishing than by commercial fishing; however, sport fishing catches are not quantified.

CONTACT REPORT

AGENCY/AFFILIATION: U.S. Army Corps of Engineers		
DEPARTMENT: Water Resources		
ADDRESS/CITY: 211 Main Street/San Francisco		
COUNTY/STATE/ZIP: San Francisco/California/94105-1905		
CONTACT(S)	**TITLE**	**PHONE**
1. Carlos Hernandez	Hydraulic Engineer	744-3359
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 8/27/90
SUBJECT: Flood frequency		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

The site is not in a 100-year floodplain. The frequency of flooding is less often than every 100 years; therefore, it is in the 500-year floodplain.

CONTACT REPORT

AGENCY/AFFILIATION: City and County of San Francisco		
DEPARTMENT: Dept. of Public Works (DPW)		
ADDRESS/CITY: 1550 Evans Avenue/San Francisco		
COUNTY/STATE/ZIP: San Francisco/California/94124		
CONTACT(S)	**TITLE**	**PHONE**
1. Harold Coffee	Project Manager	550-2750
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 8/29,9/6
SUBJECT: Agency involvement		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

8/29/90

Mr. Coffee was the project manager for the sewer construction project that took place at the Buckeye Properties site. This project, known as the Yosemite-Fitch Outfall Consolidation (YFOC) project, began in 1986 and was completed in 1989. He has the pertinent sampling reports and will send them to FIT.

9/6/90

Mr. Coffee requested more information regarding my investigation. He wants to check with DPW's lawyers before sending FIT any reports.

10/1/90

FIT has not received the reports yet.

CONTACT REPORT

AGENCY/AFFILIATION: EPA		
DEPARTMENT: Site Assessment		
ADDRESS/CITY: 1235 Mission Street/San Francisco		
COUNTY/STATE/ZIP: San Francisco/California/94105		
CONTACT(S)	**TITLE**	**PHONE**
1. Paul La Courreye	Site Assessment Manager	744-1914
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 9/13/90
SUBJECT: Scoping Management		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Paul La Courreye directed FIT to call Chuck Flippo of EPA regarding whether the site should be included in the Hunters Point NPL site. He wants us to proceed with the PA regardless. FIT should also list the industries currently occupying the site.

CONTACT REPORT

AGENCY/AFFILIATION: City Debris		
DEPARTMENT:		
ADDRESS/CITY: 1300 Yosemite Avenue		
COUNTY/STATE/ZIP: San Francisco/California		
CONTACT(S)	**TITLE**	**PHONE**
1. Dien Nguyen		822-3334
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 9/21/90
SUBJECT: Nature of his business		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Mr. Nguyen said that they haul construction site debris and separate wood and other recyclables. No chemical products are involved. They have been at this location (on the northwest side of Hawes Street between Yosemite and Armstrong Avenues) for 3 to 4 months.

CONTACT REPORT

AGENCY/AFFILIATION: U.S. Geological Survey		
DEPARTMENT: Water Resources/Projects Office		
ADDRESS/CITY: Fed Bldg., Rm. W-2234, 2800 Cottage Way, Sacramento		
COUNTY/STATE/ZIP: California 95825		
CONTACT(S)	**TITLE**	**PHONE**
1. Scott Hamlin	Hydrologist	916-978-4648
2. Gus Yates	Hydrologist	
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 10/2/90
SUBJECT: Drinking water wells		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Mr. Hamlin said there are no pubic drinking water wells in San Francisco. All SF water comes from the Hetch Hetchy Reservoir. He was not aware of any private wells in San Francisco.

Mr. Yates said there are some public drinking water wells in the northern part of Daly City, but they are west of Mission Street, which is outside the 4 mile limit. He was not aware of any private wells in northern San Mateo County.

CONTACT REPORT

AGENCY/AFFILIATION: City of Brisbane		
DEPARTMENT: Public Works		
ADDRESS/CITY: 44 Visitacion Avenue/Brisbane		
COUNTY/STATE/ZIP: San Mateo/California/94005		
CONTACT(S)	**TITLE**	**PHONE**
1. Lois O'Connor	Admin. Secretary	467-1515
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 10/2/90
SUBJECT: Drinking water		
SITE NAME: Buckeye Properties	**EPA ID#:** CAD982392243	

The City of Brisbane purchases all their water from the City of San Francisco.

CONTACT REPORT

AGENCY/AFFILIATION: Candlestick Point State Recreation Area		
DEPARTMENT:		
ADDRESS/CITY: 1150 Carroll Ave/San Francisco		
COUNTY/STATE/ZIP: San Francisco/CA/94124		
CONTACT(S)	**TITLE**	**PHONE**
1. Margaret Gabil	District Superintendent	415-557-4069
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 3/6/91
SUBJECT: Agency involvement		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

3/6/91

Candlestick Point State Recreation Area owns the land between Griffith St. and Double Rock. They have done sediment and surface water sampling in South Basin Inlet in the past year. Holguin and Associates was contracted to do this sampling. Ms. Gabil has a map of their land, but it is too big to send. She would like to meet with FIT to discuss the site.
FIT must make a written request for sampling results.

3/14/91

Ms. Gabil received FIT's request and mailed the information 3/13/91. Candlestick Point State Recreation Area is designated for wildlife management. This agency is in the process of writing a wetlands restoration plan. The California Dept. of Fish and Game has noted that burrowing owls (*Athene cunicularia*) are species of special concern at Candlestick Point State Recreation Area. Jan Anderson of the Audubon Society may be more informed of state or federal designated endangered or threatened species.

4/25/91

There are two fishing piers at Candlestick Point State Recreation Area. One is off Hunters Point Expressway by Coleman, and the other is located approximately 0.5 mile from Double Rock at the end of the Point. The Navy started sampling adjacent to their property northwest of the canal.

CONTACT REPORT

AGENCY/AFFILIATION: California Dept. of Parks and Recreation		
DEPARTMENT: San Francisco District		
ADDRESS/CITY: 2211 Garden Rd./Monterey		
COUNTY/STATE/ZIP: CA 93940		
CONTACT(S)	**TITLE**	**PHONE**
1. Ken Gray	Sr. Resource Ecologist	408-649-2862
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 3/18/91
SUBJECT: Agency involvement		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Files for the San Francisco District are kept at the California Department of Parks and Recreation's Monterey office. Funding for the Holguin, Fahan and Associates Assessment Report on Candlestick Point State Recreation Area came from a grant from the San Francisco Clean Water Program (SFCWP) which was paid to the Dept. of Parks and Recreation in lieu of a fine on SFCWP by RWQCB. Few copies of that report were made. One copy was given to RWQCB. Mr. Gray did not know whether there was an EPA ID number associated with their site.

CONTACT REPORT

AGENCY/AFFILIATION: California Dept. of Health Services		
DEPARTMENT:		
ADDRESS/CITY: 700 Heinz Ave./Berkeley		
COUNTY/STATE/ZIP: Alameda/CA/94710		
CONTACT(S)	**TITLE**	**PHONE**
1. Steve Krival	Project Manager	415-540-3841
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 3/18/91
SUBJECT: Bay Area Drum		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Bay Area Drum is a drum recycling site on the State Superfund List. It is currently in the remedial investigation/feasibility study (RI/FS) stage. Dames & Moore issued a Phase II RI/FS report dated April 1990. This report lists about 50 potential sources of contamination in the area. Background levels of lead were also studied. Contamination seems to be limited to the location of the actual facility with the exception of groundwater contamination, which seems to be limited to a one-block area around the site. Groundwater flows both SSW and E. Bay Area Drum is on top of fill with a geological outcrop under the site. The surface gradient drops sharply to the south and east.

The Bay Delta Estuary Project referred to Yosemite Canal as one of the most contaminated areas in San Francisco Bay.

The Yosemite Fitch Outfall Consolidation Project (YFOC) is being studied through DHS's Preliminary Endangerment Assessment Program. Wei Wei Chuy has more information on the YFOC; her phone number is 540-3748.

FIT may come into the DHS office to review and copy the Dames and Moore report.

CONTACT REPORT

AGENCY/AFFILIATION: California Dept. of Parks and Recreation		
DEPARTMENT: San Francisco District		
ADDRESS/CITY: 2211 Garden Rd./Monterey		
COUNTY/STATE/ZIP: CA 93940		
CONTACT(S)	**TITLE**	**PHONE**
1. Steve Zembsch	Resource Ecologist	408-649-7115
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 3/19/91
SUBJECT: agency involvement		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

DHS is required to do a preliminary endangerment assessment for sites that are going to be used by the public. Nina Antonio at DHS (phone: 540-3802) would have more information on that.

Candlestick Point Recreation Area acquired lands on both sides of the canal within the last 7 years.

RWQCB contacts include Lester Feldman (phone: 464-1332) and Tom Gandesbury (phone: 464-0841). George Rackelman in Sacramento has the longest history of contact with the Parks Dept.

CONTACT REPORT

AGENCY/AFFILIATION: U.S. Geological Survey		
DEPARTMENT: Water Resources Division		
ADDRESS/CITY: 345 Middlefield Rd./Menlo Park		
COUNTY/STATE/ZIP: CA/94025		
CONTACT(S)	**TITLE**	**PHONE**
1. Fred Nichols		415-329-4411
2.		
E & E PERSON MAKING CONTACT: Jennifer Eberle		**DATE:** 4/1/91
SUBJECT: Clamming in South Basin Inlet		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

There is a National Oceanic Atmospheric Administration report on sampling in the San Francisco Bay that indicates that the South Basin Inlet is the most contaminated site in the entire bay. There may have been clamming in the South Basin Inlet, but it will not be easy to find relevant documentation. The "Ecology of Soft Bottom Benthos of San Francisco Bay" by Mr. Nichols, published by the U.S. Fish and Wildlife Service Community Profile in September 1988, deals with clamming. To find historical information on this subject, Mr. Nichols recommended three reports: (1) "Survey of Sport Shellfishing Potential in San Francisco Bay in Southern San Francisco and Northern San Mateo," Final Report, by Jim Sutton, published by the City/County of San Francisco Wastewater Program, 1978; (2) "Selected Shellfish Resources of San Francisco Bay," by McAllister and Moore, published by California Dept. of Fish and Game, 1982; and (3) "Historical Review of Fish and Wildlife Resources in San Francisco Bay Area," by John Skinner, published by California Dept. of Fish and Game, 1962.

CONTACT REPORT

AGENCY/AFFILIATION: DTSC		
DEPARTMENT: Site Evaluation		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Len Miller		510-540-3803
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 08/25/92
SUBJECT: Status of Investigations Relating to Bay Fill		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

Mr. Miller is unaware of any comprehensive work being done on contamination related to bay fill. Polynuclear aromatics (PNAs) are common in bay fill. Metals including lead are also common. He will check his database to see whether there are nearby sites, and I am welcome to come in to review the files.

Lois Tomlinson is the new file clerk.

DTSC is involved at the Hunters Point Shipyard site and may have been involved in the past at the Bay Drum site.

San Francisco legislation requires soil testing of bay fill; Mr. Miller thinks the regulation is City and County Article 20.

CONTACT REPORT

AGENCY/AFFILIATION: City and County of San Francisco		
DEPARTMENT: Public Health, Toxics		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Steven Low		415-554-2789
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 08/26/92
SUBJECT: Status of Nearby Sites		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

Pam Hollis is the regular person who handles questions regarding Article 20, a Public Works law, but she is on vacation. The law requires that persons who move more than 50 yards of fill must submit a site history report and conduct a public meeting.

CONTACT REPORT

AGENCY/AFFILIATION: City and County of San Francisco		
DEPARTMENT: Public Health, Toxics		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Pam Hollis		415-554-2792
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 09/11/92
SUBJECT: Status of Nearby Sites		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Ms. Hollis stated that the only site in the area where removal has taken place is associated with the Griffith Street Pump Station.

CONTACT REPORT

AGENCY/AFFILIATION: Buckeye Properties		
DEPARTMENT:		
ADDRESS/CITY: 4 Buckeye Road/Belvedere		
COUNTY/STATE/ZIP: Marin/CA/94920		
CONTACT(S)	**TITLE**	**PHONE**
1. Reginald Ricci	Property Owner	415-435-4740
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 1/28/93
SUBJECT: Site history		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

Mr. Ricci owns the Buckeye Properties site. There has been no activity regarding the environmental concerns there since 1990.

Mr. Ricci's father purchased portions of the site between 1954 and the mid1960s. Parcel 1 of 3 of Block 4845 was purchased in the mid1950s, and Block 4846 was purchased in the early 1960s. Part of the property was purchased from a private consortium, and the part along the railroad right-of-way was purchased from the Navy. According to Mr. Ricci, most of the known contamination is on land purchased from the Navy in the late 1960s.

The business owned by Mr. Ricci's family conducted no wood treatment on site although treated lumber was stored on site. Mr. Ricci's theory on the origin of the contamination is that the Navy dumped wastes all over the area. This is based on his recollection that the Navy controlled access to the area and on the nature of wastes found in the subsurface.

CONTACT REPORT

AGENCY/AFFILIATION: Harding Lawson Associates		
DEPARTMENT:		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Carl Michelson		415-899-7358
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 1/28/93
SUBJECT: "Off-site" investigations associated with Hunters Point		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

01/28/93

Mr. Michelson is working with the Navy on site characterization activities. He indicated that some preliminary work had been done along the railroad right-of-way to Hunters Point but that the work was limited to a PA and focused on the area along Crisp Avenue to Underwood Avenue. An SI is currently underway which will include a shallow boring along the tracks.

PAHs and metals (Pb, ZN, and Cu) are ubiquitous in fill materials at Hunters Point. Examples of fill areas where investigations have been done include Installation Restoration sites IR-6 and IR-7 within Operable Units OU-2 and OU-4, respectively. Within Site IR-7, the contamination appears to be associated with the fill rather than a point source. Metals may also be associated with local serpentine formations, which were used for fill.

The US Army Corps of Engineers may be assessing off-site areas.

06/15/93

The Albion Water Company draws drinking water from a spring 1 mile north of Hunters Point.

CONTACT REPORT

AGENCY/AFFILIATION: City of San Francisco		
DEPARTMENT: Public Works		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Chris Phanartzis	Consultant	415-431-9430
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 1/27/93
SUBJECT: Combined sewer overflows (CSO) to South Basin		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Mr. Phanartzis is a consulting engineer for the City and is familiar with CSO problems near Hunters Point.

There were three CSO points near the South Basin: one on Yosemite between Ingalls and Hawes, one at Fitch and Bancroft, and one at Fitch and Wallace. CSO contains stormwater and untreated sewage. Before about 1990, overflows were common, occurring 50 to 60 times per year over a 40-year period. Currently the system is designed to prevent overflows more than once per year.

Jim Salerno may have information regarding analyses of the CSO.

CONTACT REPORT

AGENCY/AFFILIATION: City of San Francisco		
DEPARTMENT: Public Works		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Jim Salerno		415-648-6882
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 1/28/93
SUBJECT: Combined sewage overflows (CSO)		
SITE NAME: Buckeye Properties		**EPA ID#:** CAD982392243

Mr. Salerno has no readily available data on the quality of overflows prior to the City's up-grade of the system in about 1988. There is, however, a 1979 report on Bayside overflows by CH2M Hill.

Historically, the levels of contaminants released to the Bay were significant. There was no treatment of sewage prior to 1951, only primary treatment from 1951 to 1982, and secondary treatment since 1982. Until the system was upgraded in 1988, CSOs occurred when it rained.

CONTACT REPORT

AGENCY/AFFILIATION: City of San Francisco		
DEPARTMENT: Public Works		
ADDRESS/CITY:		
COUNTY/STATE/ZIP:		
CONTACT(S)	**TITLE**	**PHONE**
1. Steve Mollinax		415-744-4166
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 02/22/93
SUBJECT: Site status/history		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

Mr. Mollinax is familiar with the Buckeye site as it relates to the Yosemite Fitch Outfall project. Prior to the excavation at the site, DPW investigated seepage of what appeared to be petroleum from the site to the adjacent channel; however the investigations never revealed a source.

During the excavation along Armstrong Avenue in 1986 and 1987, free product was discovered. The fill material observed during the excavation was not like that commonly found along the Bay; it contained bed pans, 4-inch-thick steel cable, railroad carriages, mess kits, and drums. Mr. Mollinax does not believe the wastes are associated with activities at the site since it was formally developed although recent activities have likely contributed to minor surficial contamination. He speculated that the wastes may be associated with the decommissioning of the Hunters Point shipyard and that contamination is not limited to the Buckeye site. He also noted that the area in general was used for open dumping for many years until the 1970s.

The City believes that the outfall may provide a barrier to prevent or slow contaminant migration and that the site poses relatively little threat unless it is developed. The City determined that an effort to identify responsible parties and obtain their cooperation would likely be costly.

CONTACT REPORT

AGENCY/AFFILIATION: Albion Water Company		
DEPARTMENT:		
ADDRESS/CITY:		
COUNTY/STATE/ZIP: San Francisco/CA		
CONTACT(S)	**TITLE**	**PHONE**
1. Michael Mee		415-821-3444
2.		
E & E PERSON MAKING CONTACT: James M. James		**DATE:** 06/15/93
SUBJECT: Groundwater Use		
SITE NAME: Buckeye Properties		**EPA ID#:**CAD982392243

The Albion Water Company (Albion) taps a spring located at 895 Innes Avenue about 1 mile north of Hunters Point. Geologists have suggested that the water is from a deep and distant source; there is only bedrock beneath the area.

Albion serves about 5,000 customers, although some of them are provided purified water from a municipal water source rather than the spring. The spring water is tested annually for Title 22 metals, organics, and coliform, and there have been no problems.

Albion has tapped the spring since the 1940s, and the spring supplied water for a brewery prior to 1940. There are some other springs in the area, but no one uses them.

APPENDIX B

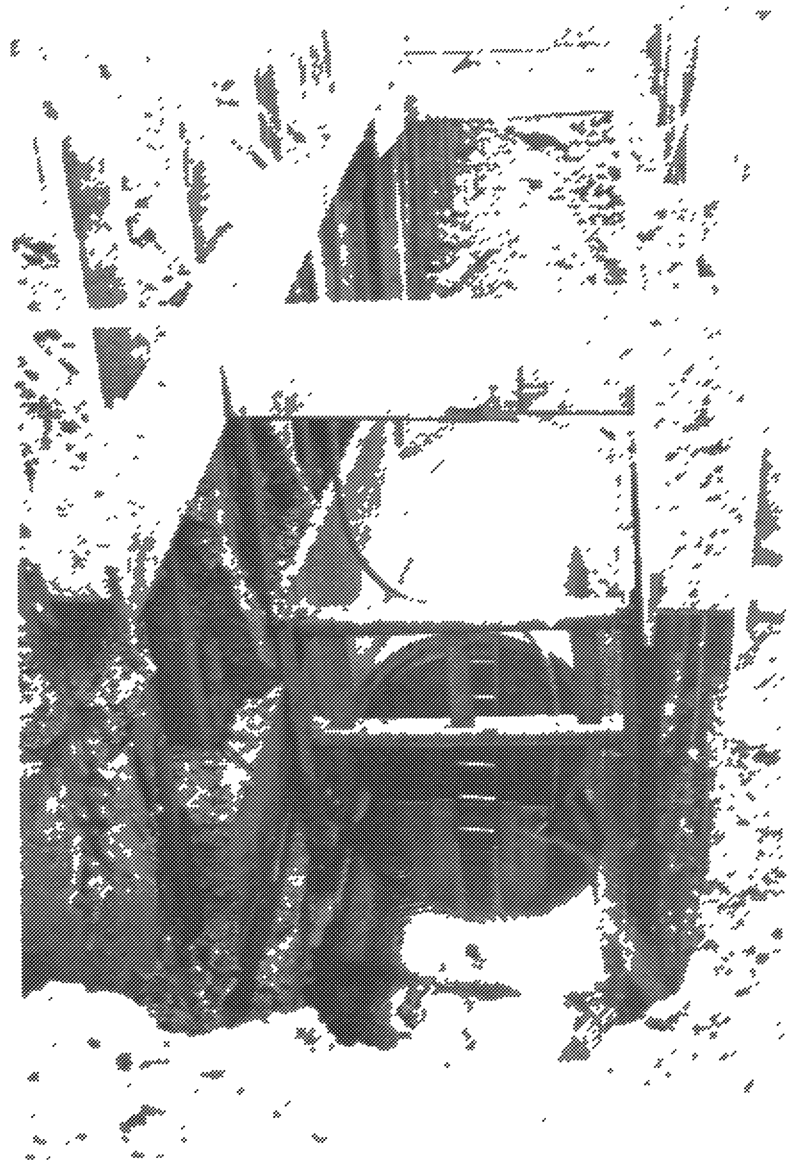
PHOTODOCUMENTATION

FIELD PHOTOGRAPHY LOG SHEET

DATE: 1986 1987

PHOTOGRAPHED BY:

Reginald Ricci,
Buckeye Properties



DESCRIPTION   According to Mr. Ricci: This photograph shows the excavation for the 1986 1987 City of San Francisco sewer consolidation project; the excavation was 10 to 40 feet deep and the pipe was 8 feet in diameter; and the liquid around the pipe is waste material that smelled like creosote.

FIELD PHOTOGRAPHY LOG SHEET

DATE: 1986-1987

PHOTOGRAPHED BY:

Reginald Ricci,
Buckeye Properties

DESCRIPTION- According to Mr. Ricci, this photograph shows the excavation for the 1986-1987 City of San Francisco sewer consolidation project. Visible staining appears to be limited to the subsurface soils.

FIELD PHOTOGRAPHY LOG SHEET

DATE: 1986-1987

PHOTOGRAPHED BY:

Reginald Ricci,
Buckeye Properties

DESCRIPTION: According to Mr. Ricci, this photograph shows the excavation for the 1986-1987 City of San Francisco sewer consolidation project. Visible staining appears to be limited to the subsurface soils.

jj/buckeye/fpls

zq2150.1.0

FIELD PHOTOGRAPHY LOG SHEET

DATE: 02/03/93

DIRECTION:

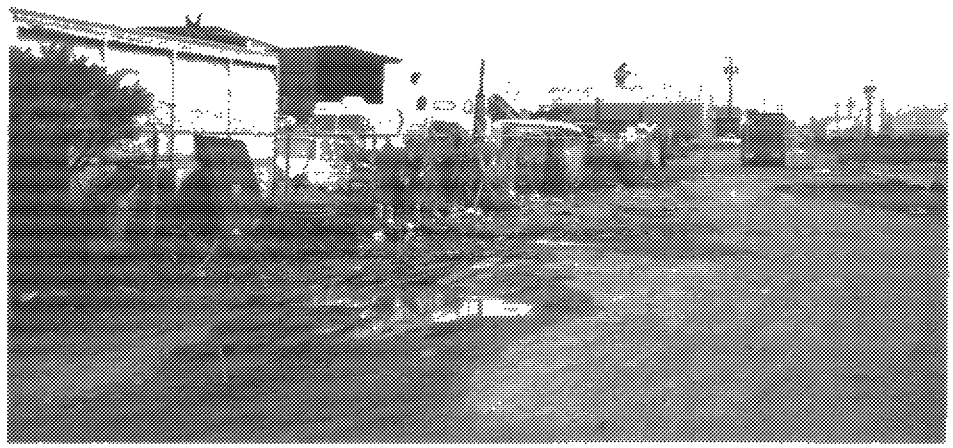
Northwest

WEATHER: Cool,

Overcast

PHOTOGRAPHED BY:

Peter Geiger



DESCRIPTION: View northwest along Yosemite Ave. Buckeye Properties on left. Note disabled vehicles, debris, fence, and warehouses.

DATE: 02/03/93

DIRECTION:

Northeast

WEATHER: Cool,

Overcast

PHOTOGRAPHED BY:

Peter Geiger

DESCRIPTION: View from Yosemite Ave. at Griffith St., northeast across South Basin Inlet. Note storm sewer outfall.

FIELD PHOTOGRAPHY LOG SHEET

DATE: 02/03/93

DIRECTION:

Northeast

WEATHER: Cool,

Overcast

PHOTOGRAPHED BY:

Peter Geiger

DESCRIPTION: View northeast along old Navy railroad right-of-way. Note spilled drum, and miscellaneous debris. This area is not on Buckeye Properties.

DATE: 02/03/93

DIRECTION:

West

WEATHER: Cool,

Overcast

PHOTOGRAPHED BY:

Peter Geiger

DESCRIPTION: View west along old Navy railroad right-of-way. Note miscellaneous debris. This area is not on Buckeye Properties.

8/13/93 3525

CT

p/s m112 Jm2

SAM C. Douglas

REPORT TRANSMITTAL

Date delivered to H-8-1: CAD982392243

Copies of this Screening Site Inspection for the Buckeye Properties site should be sent to the following agencies and individuals:

Reginald Ricci
4 Buckeye Road
Belvedere, California 94920

SEP 17 1993

in Track

Roberta Blank
US EPA
H-9-2

Bonnie Arthur
DTSC
700 Heinz Ave., Suite 200
Berkeley, California 94710

Bonnie Smith
RWQCB
2101 Webster, Suite 500
Oakland, California 94612

Steve Mollinax
City of San Francisco Department of Public Works
1550 Evans Ave.
San Francisco, California 94124

Christopher M. French, R.G.
R.G. #4465
R.E.A. #00307
Environmental Investigation, Remediation, and Risk Assessment
2735 Elmwood Avenue
Berkeley, California 94705
(415) 486-0722

November 12, 1989

Mr. W. Thomas Amen
Amen, Keith & Berg
847 Sansome Street
San Francisco, CA 94111

Subject: Phase I Report for Property located in San Francisco, CA

Dear Mr. Amen:

Christopher M. French, R.G. is pleased to present this Phase I report for property located in the vicinity of the Yosemite-Fitch Outfall Consolidation project in the City and County of San Francisco, California. The scope of work included a compilation and evaluation of findings to date pertaining to 1) physical setting, 2) contaminant source verification, 3) hazardous waste characterization, and 4) risk assessment.

1.0 BACKGROUND AND EXECUTIVE SUMMARY

Amen, Keith & Berg retained Christopher M. French, R.G. for the purpose of evaluating the presence or absence of hazardous waste potentially present beneath property located within the area of the Yosemite-Fitch Outfall Consolidation (YFOC) project in the South Basin area of southwest San Francisco, California. The location of the subject property is shown in Plate 1, Attachment A. A plot plan of the subject property is presented in Plate 2.

The City and County of San Francisco proposed construction of the YFOC transport/storage facilities in order to reduce sewage overflows and to transport wet and dry weather flows to treatment and/or pumping plants. The project encompassed a sixteen block area surrounding the Fitch Street, Griffith Street and Yosemite Avenue outfalls.

Geotechnical and environmental studies were completed prior to construction. A hazardous waste investigation was completed for the City and County of San Francisco by the consulting firm ERM-West. The potential presence of hazardous waste was discovered beneath the public right of ways adjacent to the subject property as a result of the ERM-West investigation. Based upon the results of the field investigation, a remedial action plan was proposed by ERM-West to mitigate conditions which would be encountered during construction in the

Ref. #3

public right of way.

Observations and photographs, made in the course of the construction project by the owner of the subject property and others, suggest that a large portion of the area excavated along Armstrong Avenue and Hawes Street was historically used for the indiscriminate dumping of solid waste, construction debris, waste oil and uncontained or drummed liquid chemical waste.

As a result of past indiscriminate disposal practices during the time period prior to site development in approximately 1955, and potentially as a result of subsequent subsurface construction activities, an area of floating product has come to be located on the groundwater table beneath the subject property in the area bounded by a portion of Hawes and Armstrong. The floating product is known to be composed of polycyclic aromatic hydrocarbons (PAHs), chlorinated hydrocarbons and aromatic hydrocarbons, but insufficient chemical analyses have been conducted in order to provide for full characterization of the waste.

In addition, review of photographs taken during construction of the YFOC project indicate that construction activities may potentially have contributed to the release of additional liquid waste into the substrate. Further, the backfill surrounding the concrete sewer and outfall is composed of porous material. This material facilitates rapid movement of contaminated groundwater and liquid contaminants. The lateral migration of contaminants within the backfill may contribute to spreading of contamination around the perimeter of the subject property.

Following completion of the project, the owner of the subject property, at his own initiative and expense, undertook to further investigate the source and possible magnitude of the subsurface contamination discovered in the process of construction of the YFOC Project. This report presents a review and assessment of data compiled by the property owner to date. In addition, data pertaining to the environmental and public health risks posed by chemical constituents present in the subsurface, to the extent ascertainable given the limited data, are discussed herein. Additional data, provided to Amen, Keith & Berg by the City and County of San Francisco subsequent to the date of completion of this report, has not been evaluated within the scope of the Phase I investigation.

1.1 Executive Summary

The property is underlain by artificial fill, younger bay mud, and bay side sand to the depth explored by geotechnical investigations. The artificial fill and younger bay mud are generally considered to be potentially subject to structural instability, and extensive engineering design is generally recommended for structures constructed in such material.

Groundwater is located at less than three to five feet beneath the subject property. Tidal fluctuations may affect the groundwater flow direction and gradient. In addition, an upward (vertical) hydraulic gradient may be present in the general vicinity of the subject property.

A substantial portion of the subject property appears to have been located bayward of the line of mean high tide prior to 1942. A potential minor discrepancy may exist between the delineation of the mean high tide line as surveyed by Allardt (1868) and the shoreline as delineated in historic aerial photographs. A document addressing legal problems associated with jurisdiction of tidelands and marshes is provided as an attachment to this report.

The U.S. Navy condemned and took possession of lands adjacent to the subject property for the purpose of constructing a railroad to the Hunters Point Naval Shipyard in 1942. Initial review of court documents suggests that public access bayward of the U.S. Navy railroad right of way was restricted during the 1940s and subsequent years. Review of aerial photography for the period 1939 - 1957 indicates that the portion of the subject property known to be underlain by contamination emerged from the bay prior to 1948. Aerial photographs from 1946 and 1948 appear to indicate that the contaminated area was characterized by a shallow depression, which appears to have been filled with debris and may have contained ponded liquid.

Access to the site appears to have been restricted to the railroad access road prior to 1948. In 1948 and subsequent years, access to the site may have been possible via one or more access points. By the time interval 1951-1953, the area of contamination was subject to final fill and grading operations.

Based on review of aerial photography, the areal extent of contamination may be greater than currently defined. In addition, additional sources of contamination may be present in close proximity to the subject property, including an area approximately located within the confines of property owned by the State of California.

Excavation activities associated with the YFOC project exposed considerable construction debris, scrap iron, military hardware, naval rigging and hospital waste, as well as buried drums, waste oil, and liquid chemical waste. A newspaper clipping obtained from the excavation area places an approximate time stamp of 1944 on fill activities in the area of contamination. A qualitative association can be surmised between waste discovered in the YFOC project area and similar areas currently subject to environmental cleanup at Hunters Point.

Subsurface investigations and chemical analyses of soil and groundwater performed by ERM-West for the City and County of San Francisco indicate that 1) a large area of floating product is located under a portion of the subject property and 2) potentially elevated concentrations of metals, degradation products of chlorinated aliphatic hydrocarbons (notably 1,1- and 1,2-dichloroethylene), PAHs, "waste oil", and benzene may be present beneath the property. Other laboratory analyses indicate concentrations of polychlorinated biphenyls (PCBs) may also be present beneath the subject property.

Photographic evidence suggests that construction activities associated with the YFOC Project may have contributed to the release and/or migration of contaminants into the subsurface adjacent to the subject property. In addition, the porous backfill of the sewer and outfall basin may provide for migration of contamination around the perimeter of the subject property, and may provide for an exposure pathway to aquatic life in South Basin, if any.

The data paucity does not allow for a detailed discussion of appropriate regulatory criteria and guidelines. Discussions provided herein do, however, delineate appropriate sections of Title 22, California Code of Regulations (CCR), and the Porter-Cologne Water Quality Control Act.

A preliminary assessment of risk is provided in Attachment E. The assessment indicates that a low probability of risk to the environment or human health may exist, provided that a substantial route of exposure is not present. The risk assessment is subject to considerable uncertainty due to the paucity of available and reproducible data.

2.0 PHYSICAL SETTING

As shown in Plate 1, the property is located within the South Basin area, an embayment of the San Francisco Bay located between Hunters Point and Candlestick Point in southeastern San Francisco.

A plot plan of the subject property, owned by Buckeye Properties, is presented in Plate 2. The property is bounded by a U.S. Navy Railroad right of way, and by Yosemite Avenue, Armstrong Avenue, Hawes Street, and Griffith Street. The South Basin Canal is located northeast of the property, beyond an extension of Yosemite Avenue. The property is transected on a diagonal by a former railroad right of way, historically reserved by the Tide Land Commission pursuant to Chapter 543 of the Statutes of 1868, and presently leased by Buckeye Properties from the State of California and/or the San Francisco Port Commission.

That portion of Yosemite Avenue which lies adjacent to the subject property, as well as the South Basin Canal and lands located southeast of Griffith Street, are within the Candlestick Point State Recreation Area (CPSRA), administered by the State of California Department of Parks and Recreation (CDPR). Map documentation presented in Appendix B of the "Candlestick Point State Recreation Area - General Plan" (CDMR, 1988) indicates that the South Basin Canal area of the CPSRA is to be used for wetlands restoration. The subject property is identified in CDMR (1988) as an area subject to potential acquisition by the CDMR for incorporation into the CPSRA.

2.1 Zoning

As delineated in Figures 7 and 8-1 of the "San Francisco County Hazardous Waste Management Plan" (City and County of San Francisco Department of Planning, Draft Environmental Impact Report [SFDCP, Draft EIR] 1989), and Figure 13 of the "Environmental Impact Report - Yosemite Transport Storage Facilities" (City and County of San Francisco Department of Public Planning [Draft, 1983]), the site and immediately adjacent area are zoned for industrial (M-1 or M-2) use. The South Basin Canal, however, a portion of the public right of way, and the above referenced Tide Land Commission railroad right of way are zoned for public (P) use. Some nearby properties are zoned for residential (RM-1, RH-1) use.

2.2 Geology

Geologic and geotechnical conditions within the area of the Yosemite-Fitch Outfall Basin are presented in detail in "Geotechnical Investigation, Yosemite Fitch Outfalls Consolidation, City and County of San Francisco, California" (Geotechnical Consultants, Inc. [GTI], 1985) and the SFDCP Draft EIR (1988). A summary of the findings of the GTI (1985) report is provided herein.

San Francisco Bay and the alluvial and estuarine deposits in the South Basin area occupy a structurally controlled basin within the Coast Range Province. Pleistocene and Holocene sediments (less than 1.8 million years old) were deposited in this basin as it subsided (Atwater, Hedel, and Helley, 1977). In the South Basin area these sediments rest primarily on bedrock consisting of sandstone and shale of the Cretaceous (65 to 165 million years before present) Franciscan Formation (Caldwell-Gonzales-Kennedy-Tudor, 1982) and are locally overlain by artificial fill.

Subsurface conditions described in the GTI (1985) report for the Yosemite-Fitch Outfall Consolidation project were evaluated by a subsurface drilling program consisting of approximately 11 borings. The location of four of the borings, designated DH-3, DH-4, DH-9 and DH-10, are shown in Plate 2, Attachment A. Subsurface materials encountered during drilling include, in order of increasing depth beneath the subsurface, artificial fill (af), younger bay mud (Qyb), and bay side sand

(Bbs). ~~Cretaceous sandstone and shale~~ (KJf) were encountered beneath the bay side sand in other portions of the Yosemite-Fitch Outfall Consolidation project area, but were not encountered to the depth explored beneath the subject property.

2.2.1 Artificial Fill GTI

The veneer of artificial fill which covers the area is composed of a heterogeneous mixture of gravel and silty to clayey sand, with minor clay lenses. The artificial fill was encountered to a maximum elevation of approximately -11 feet (San Francisco City Datum [sfcd]) beneath the subject property. The site lies at an approximate elevation of -2 feet (sfcd). In addition to the above mentioned earth materials, the artificial fill is reported by GCI (1985) to contain wood, boulders, and large blocks of construction debris. The lithologic logs of borings indicate that Borings DH-4 and DH-10 both encountered oily material in the shallow subsurface.

Photographic evidence, obtained by the owner of the subject property during excavation and construction of the Yosemite-Fitch Outfall Project, indicates that artificial fill located along the property boundary beneath Hawes and Armstrong includes a considerable amount of material apparently derived from the World War II war effort, including significant amounts of ship rigging and cables, large quantities of stainless steel, canteens, hospital waste including bedpans, IV bottles, and empty pharmaceutical bottles, jeep tires, metal shop waste, railroad carts and waste, metal drums and containers occasionally containing a waste oil - like liquid, and large quantities of hot water heaters. Photographs of the sidewall of excavations indicates that voids within the fill are occasionally filled with a waste oil - like substance. A fragment of a newspaper obtained from a portion of the excavation is dated November 30, 1945.

Subsequent shallow drilling within the artificial fill was performed in late 1986 in the area of the Yosemite Fitch Outfall Consolidation project, by Environmental Resources Management-West (ERM-West), for evaluation of the presence or absence of contamination. The results of the ERM-West drilling program are presented in a subsequent section entitled "ERM-West Drilling

Investigation (1986)".

2.2.2 Younger Bay Mud

The younger bay mud is reported to be a soft to medium stiff, compressible, gray-green to gray clay or silty clay with a Unified Soil Classification System (USCS) designation of CH. Local lenses of peat (PT), organic clay (OH), and sand (SC to SP) are also present. Thin discontinuous layers of sand, silt and shell fragments are reportedly present in the formation, which was encountered to elevations of approximately (-)22 to (-)30 feet (sfcd) beneath the artificial fill of the subject site, for a total approximate thickness of 11 to 19 feet.

2.2.3 Bay Side Sand

The Bay Side Sand is comprised of clayey to clean sand (SW, SP, SM and SC) that varies from green to brown-red and is medium dense to very dense. Local lenses of clay (CH) and sandy silt (ML) are also present. The sand is present below an elevation of (-)22 to (-) 30 feet (scfd) beneath the subject property, and rests unconformably upon the Jurassic bedrock. The bedrock unit was not encountered beneath the subject property to the maximum depth drilled, approximately (-) 60 feet (scfd).

2.3 Hydrogeology

A groundwater contour map of the South Basin area is presented in Plate 3, Attachment A (City and County of San Francisco Department of City Planning, 1989, referencing others). Groundwater flow within the area of the subject property appears to be directed northward, towards the South Basin channel. The lobate shape of the groundwater contour map southeast of the subject property appears to reflect the presence of a shallow bedrock ridge within the area.

The GCI (1985) report indicates that the groundwater level recorded in a piezometer screened between depths of 7 and 18 feet within the artificial fill was at an approximate elevation of (-)5.5 feet (sfcd) in August, 1984. By contrast, a piezometer screened within the bay side sand between depths of 39 to 59 feet recorded a groundwater elevation of (-) 2.5 feet (sfcd).

Consequently, groundwater flow at depth appears to occur under semiconfined to confined conditions, and an upward groundwater flow component may be inferred. An approximate upward vertical gradient of 0.08 feet per foot may be inferred for the data provided in GCI (1985).

The GCI (1985) report further indicates that one well, located approximately 500 feet from the South Basin canal, was equipped with a continuous water level recorder to record fluctuations in the static groundwater table due to tidal variations. No significant tidal influence was recorded. The report indicates, however, that fluctuations may occur closer to the South Basin (Yosemite) Canal.

No Tidal ?

2.4 Seismicity

As discussed in the SFDCP Draft EIR (1988), three active faults located within the immediate San Francisco area are capable of producing a major earthquake. These are the San Andreas, Hayward and Calaveras Faults. All three are associated with the northwest trending San Andreas fault system. The San Andreas is the nearest recognized active fault to the southeast area of San Francisco, at a distance of approximately nine miles to the southwest. The Hayward and Calaveras Faults are approximately 11 miles and 23 miles to the east of the site, respectively.

Seismic hazards associated with a major earthquake on any of the active Bay Area faults that would potentially impact the area of the subject property include: ground shaking, subsidence, liquefaction, tsunami, and reservoir failure and inundation (flooding) (Draft EIR, 1988).

2.5 Soil Stability

It is generally recognized (Nichols and Wright, U.S.G.S., 1971) that the physical properties of marshlands and tideland sediments in general, including the high water content (generally more than 50 % by weight); the low bearing strength; the high compressibility (especially where containing peat deposits); the moderately high sensitivity; and, in some areas, a high shrink-swell ratio, constitute factors that must be considered in the exploration, testing design, and construction of engineering projects on younger bay mud. These properties, along with the varying thickness and grain size over relatively short distances, can result in marked local differential and regional settlement and in slope instability when loads are imposed on settlements.

Review of site conditions and interviews with the owner of the subject property suggest that construction of the Yosemite Fitch Outfall structures may have negatively impacted the structural stability of the subject property. Indications of settlement along Hawes Street are especially noticeable, including areas of localized subsidence, structural offsets within buildings, soil rupture and cracking or tilting of concrete foundations. However, a detailed review of preconstruction geotechnical reports, and review and study of as built conditions of the outfall structures and associated evaluation of potential structural damage to the property is beyond the scope of this report.

2.6 Tidal Information

As shown in Plate 12 of CDPR (1988), tidal information published by the U.S. Department of Commerce National Oceanic Survey - May, 1977 provides the following datum for tidal levels:

Mean higher high water - 6.6 feet
Mean high water - 6.0 feet
Mean tidal level - 3.5 feet
Mean lower low water - 0.0 feet
Extreme low water - (-) 2.5 feet

The datum is not given. It is inferred that the elevations are presented relative to mean sea level, U.S. Coast and Geodetic Survey datum of 1929.

3.0 HISTORY OF SOUTH BASIN

A detailed history of land use and development within the subject area is provided in Dow (1973). Most of the land underlying the area landward of the subject property was reclaimed from San Francisco Bay during the latter half of the 19th century (Dow, 1973). The subject property and other nearby lands within the approximate area of the Yosemite Fitch Outfall Consolidation Project were reclaimed from San Francisco

Bay by the middle of the 20th century. According to Dow (1973), prior to filling, the area lying southwest of Hunters Point "was a pleasant basin-like valley .." with a "crescent-shaped shoreline ... indented with small coves and tiny beaches."

3.1 Tideland Survey

The tidelands of the area southwest of Hunters Point were surveyed by George Allardt in 1868 for the State Tide Land Commissioners, who then sold them to private parties. According to Dow (1973), the "offshore submerged lands" southwest of Hunters Point "were the most extensive to be surveyed and sold in San Francisco by the state. The cove containing these submerged lands was named South Basin and it was here that most of the fill took place." Further,

> "Here...more than any other point of San Francisco bay fill occurred with the least notice. It began as early as 1863 and continues today. Unfortunately, the record is either unclear or totally silent on many of the particulars. Even today (1972), with government's many bureaus...and all the hearings, administrative approvals, permits, rules and regulations regarding filling of San Francisco Bay, unauthorized fill continues at South Basin. ...The City and County of San Francisco is aware of the unauthorized fill being placed at South Basin as is the San Francisco Bay Conservation and Development Commission; in fact, the B.C.D.C. has several lawsuits pending against the City of San Francisco regarding this fill."

3.1.1 Historic Shoreline

Several datum exist which delineate historic shorelines. Dow (1973) references an 1859 shoreline survey (U.S. Coast Survey Chart No. 621). Geotechnical Consultants, Inc. (1985), referencing Dow (1973), provide a figure (Figure 2 - Historic Shoreline) showing the location of what is referenced as an 1849 shoreline. The figure indicates that the subject property was located primarily bayward of the shoreline. Nichols and Wright (USGS, 1971) reference the U.S. Coast and Geodetic Survey of 1852 for the Scale 1:125,000 "Preliminary Map of Historic Margins of Marshland, San Francisco Bay, California". Given the limitations of scale, this map also appears to indicate that the property was located outside (bayward) of the outer edge of marsh, which normally may be defined as "mean high water", although technical limitations to an exact definition of "mean high water" may exist (USGS, 1971). The U.S. Coast and Geodetic Survey Map of 1942, shown in Plate 3, Attachment A, likewise indicates that the subject property was located primarily bayward of the outer edge of marsh. The above referenced map by Allardt (1868), however, surveyed for the State Tide Land Commission, identifies an "Ordinary High Tide Line" which transects a substantial portion of the subject property approximately 100 feet northwest of the present location of Hawes Street. This latter survey has historically and legally served as the basis for most maps of lands situated in the South Basin area.

3.2 Site History (Mason Tillman Associates, 1986)

A site history report for the subject property has been previously prepared by Mason Tillman Associates (June, 1986). As discussed in the report,

> "The Ricci and Kruse Lumber Company has been in the retail business selling various types of woods and related materials on the project site since the mid 1950s. Research failed to disclose any operation on this site by Ricci and Kruse Lumber Company which would have created or produced hazardous wastes.
>
> "The project site was acquired by Ricci and Kruse Lumber Company immediately after the land was brought above water. The lumber company used red rock fill to further raise the land level along the perimeters of the project site, ultimately bringing the entire project site to the original shore line. Ricci and Kruse have been the sole and only occupants of the property since it was filled above the water level."

Subsequent discussion in the Mason Tillman (1986) report indicates that there were activities in the immediate vicinity of the project site and at greater distances, which could "possibly present an issue of contamination." Possible sources of contamination were inferred to include the Lucatex Paint, Inc. site and the Pacific Construction Company, as well as the Hunters Point Naval Shipyard. However, based upon the limited amount of evidence, Mason Tillman (1986) concluded that it was highly unlikely that any of the referenced sites would have contaminated the project area.

It is noted that the findings of the Mason Tillman Associates (1986) report concerning 1) development and occupation of the subject property, and 2) the potential for on site contamination from an off site source, were based upon limited sources of information. The review of aerial photography, presented below, does not substantiate these findings.

4.0 HUNTERS POINT NAVAL SHIPYARD

The impact wartime operations during World War II on the South Basin area appears to have been significant, primarily due to the proximity of the basin to Hunters Point Naval Shipyard. Within two years after commencement of the United State's involvement in the war, Hunters Point was transformed into a vast naval complex for maintenance of the Pacific Fleet (Dow, 1973). Operations at Hunters Point spilled over into the South Basin area as the U.S. government laid claim to portions of the basin through a series of land condemnations in accordance with the provisions of the Lanham Act.

The greatest extent of fill operations at South Basin occurred during and immediately following World War II. The largest area to be filled, the former marshland located landward of mean high water as delineated in Nichols and Wright (U.S.G.S., 1971), resulted from a need to provide temporary war housing for the workers at Hunters Point Naval Shipyard (Dow, 1973). Changes which occurred during the period of the war and the post war period were not recorded by the U.S. Coast and Geodetic Survey until 1957 (Dow, 1973).

4.1 History of Land Condemnation in South Basin (1942-1957)

During the wartime emergency, some privately owned lands in and adjacent to South Basin and Hunters Point were secured by the federal government in a series of condemnations under the conditions of the Lanham Act (Dow, 1973), and under these terms the government was allowed to take possession of land before title had passed.

According to Dow (1973) and verified by partial review of the court records, clear title to some small landholdings belonging to private individuals was not passed until years after the end of World War II. The owner of the subject property has indicated that in some instances, payment to private individuals may have been made for property which evidently was not in the individual's possession, and/or did not exist. Several cases of land disputes resulting from the land condemnations were resolved as late as 1957. Dow (1973) indicates that as late as 1972, litigation proceedings were still in process between the San francisco Port Authority (formerly the State Board of Harbor Commissioners) and the United States government over title settlement of some condemned public lands.

Impact of Condemnations on Subject Property

Sufficient evidence is present to suggest that a portion of Block 4846 contiguous with the subject property (Plate 2) was acquired in 1942 by the United States for "use in connection with the construction, maintenance and operation of the access railroad, Hunter's Point, California" (Quotation from Docket No. 22197-W, Lis Pendens, District Court of the United States in and for the Northern District of California, Southern Division, recorded June 3, 1942 [Lis Pendens does not appear to include the subject property]).

The location of the railroad right of way is shown in Plate 1 and Plate 5. The position of the subject property and railroad as shown in Plate 5 is approximate, and intended for illustrative purposes only.

Several similar condemnation actions were filed against the State of California and the City and County of San Francisco, and other parties, restricting the rights of public transport in certain areas and restricting points of access to areas located bayward of the approximate line of the Hunters Point railroad right of way. Most properties bayward of the right of way were condemned by the Navy, excepting those industrial properties which were deemed necessary for the war effort. Although the available record is fragmentary and incomplete, initial review of the documentation suggests that the area of the subject property and much of the South Basin area bayward of the railroad right of way may have been effectively isolated from all but U.S. Government activity, subject, however, to public utility easements or other restrictions.

The record of property condemnation for the subject property has not yet been made available, and may not exist. It has been suggested by the current owner of the subject property that a condemnation action may not have been required because the subject property may have been located bayward of the high water mark, and consequently may have been subject to the provisions of an act of the legislature of the State of California entitled "An Act relinquishing to the United States of America the title of this State to certain lands [approved March 9, 1897]" (Statutes of California, Thirty-second session, Chapter LXXXI).

The applicability of the referenced act is a subject for legal interpretation, and is not evaluated herein. A brief evaluation of legal problems associated with tidelands and marshes is presented in Briscoe (1979), provided for review in Attachment C.

4.2 Hazardous Waste Sites at Hunters Point and Nearby Lands

During the war and immediate post war period, much of the historic bay margin in South Basin was apparently subjected to considerable fill and dumping operations, either by the U.S. Government, its contractors, or private individuals following cessation of the war emergency. The use of the bay margin as a fill area appears, by present day standards, to have been indiscriminate, both within and outside the boundaries of the Naval Reserve at Hunters Point.

The following summary of the hazardous waste sources at Hunters Point and the vicinity is taken from "The Navy's Environmental Cleanup of Hunters Point", a brief publication available at the Information Repository of the San Francisco Public Library (Hunters Point Community Relations Program, undated), as well as other documentation present at the repository.

The Hunters Point Annex was operated as a commercial drydock facility from 1869 until it was purchased by the U.S. Navy in 1939. Following the purchase, the facility was leased to Bethlehem Steel Company. The Navy operated Hunters Point as a shipbuilding and repair facility from 1941 to 1976. At its peak, Hunters Point Naval Shipyard employed 17,000 people. In 1976, most of the shipyard was leased to Triple A Machine Shop, Inc., which operated the shipyard as a commercial ship repair facility until June 1986.

Hunters Point Annex has seen continual heavy industrial use for the past 120 years. These uses generated large amounts of industrial wastes. Wastes generated included solvents used to clean parts, acids and caustics used in fabrication of parts and sand blast waste, waste oil, waste acids, cyanide wastes, chromates and heavy metals, PCBs, unclassified chemical wastes, radioactive waste, and asbestos.

Between 1958 and 1974, the Navy used an industrial landfill (IR-1, Plate 5) to dispose of industrial wastes at Hunters Point. The Navy as well as other land users disposed of hazardous waste at other sites throughout the annex. Extensive environmental investigations at the annex have resulted in the identification of 11 hazardous waste sites at the facility. Preliminary investigations have begun at seven additional sites where contamination may have occurred.

Six of the known sites of contamination are located in close proximity to the above referenced Navy railroad right of way and access road. As shown on Plate 5, these include 1) the former industrial landfill located in a filled portion of South Basin (IR-1), 2) the Bay Fill Area, also located on land reclaimed from the bay (IR-2), 3) Oil Reclamation Ponds (IR-3), 4) the Scrap Yard (IR-4), 5) the Old Transformer Storage Yard (IR-5), and 6) the Pickling and Plate Yard (IR-9).

<u>4.2.1 Industrial Landfill (IR-1)</u>

It is reported (Regional Water Quality Control Board [RWQCB], 1987) that from approximately 1958 to 1974, the Navy disposed of industrial and solid wastes along the west shore of the shipyard. Wastes included building construction and demolition wastes, domestic waste and refuse, dredge spoil materials, sand blast waste, shop

RWQCB
report
1987

industrial and chemical waste, solvents, solid and liquid ship repair waste, and low level radioactive waste (from shipboard radium dials and electronics equipment).

4.2.2 Bay Fill Area (IR-2)

From 1945 to 1978, the southwest Bay shore area was a site used for disposal of sand blast waste (sand aggregate, steel, copper, lead, rust and lead based paint scrapings), chemicals and waste oil.

4.2.3 Oil Reclamation Ponds (IR-3)

From 1944 to 1974, Hunters Point Naval Shipyard operated a waste oil reclamation system which used two man made unlined ponds for oil storage. The Initial Assessment Study (IAS) for HPNS determined that solvents, caustic sodas, ethylene glycol and chromates were also disposed of in these ponds.

4.2.4 Scrap Yard (IR-4)

From 1954 to 1974, submarine battery lead and copper, along with used electrical capacitors (containing PCBs) were crushed and stored at this site.

4.2.5 Old Transformer Storage Yard (IR-5)

From 1946 to 1974, used electrical transformers (containing PCBs) were crushed and stored at this site.

4.2.6 Pickling and Plate Yard (IR-9)

From 1947 to 1973, the Navy utilized three acid storage tanks, three brick lined pits for dipping large steel plates, and an open storage rack used for spraying steel plates with zinc chromate.

4.3 Impact to Human Health

According to available documentation, no immediate threat to human health is apparent based upon the results of subsurface investigations. A detailed evaluation of the impact of contamination at Hunters Point will not be available until completion of the Public Health and Environmental Evaluation (PHEE).

5.0 SITE AERIAL PHOTOGRAPHIC SURVEY, 1939 - 1957

Aerial photography from the period 1939 to 1957, compiled by the owner of the subject property and received from Amen, Keith & Berg, was reviewed to provide information regarding past conditions and land uses at the subject site and in the immediate vicinity. A tabulation of the photograph compilation is provided in Table 1, Attachment B. Portions of six of the photographs have been reproduced as Plates 6 through 11, Attachment A, for purposes of discussion.

5.1 Photograph DDB-2B-124 (10-11-43)

Early aerial photographs from the period 1939 - 1943 indicate that the subject property was primarily submerged. Photograph DDB-2B-124 (10-11-43), shown in Plate 6, indicates that a large portion of the marshlands adjacent to South Basin - later filled in for provision of temporary, prefabricated housing for the Hunters Point work force - was still intact. Fill operations and apparent construction activities are observable along the U.S. Navy right of way, acquired for the purpose of constructing a Navy railroad and access highway. The fill area extends across that portion of land located adjacent to the subject property which had been subject to an apparent condemnation action in approximately 1942. The source of fill in part appears to have been a large hill located east of South Basin. Excavation cuts are observable on the hillside.

The pre-1942 shoreline - derived from superposition of the U.S. Coast and Geodetic Survey of 1942 on the photograph - is largely intact in the area of the subject property, with the exception of the aforementioned fill area. A railroad yard is present adjacent to the subject property. The yard was owned by A.D. Schraeder, a contractor who assisted in construction of the railroad to Hunters Point.

The approximate areal extent of contamination on and adjacent to the subject property, delineated by drilling operations conducted in 1986 by ERM-West, is also superimposed on the photograph. The areal extent of contamination is roughly coincident with an area located adjacent to a portion of the A.D. Schraeder property boundary which abuts against the bay margin. There is no indication of any substantial fill operation in the area of known contamination.

Examination of the Hunters Point area shows early development in source area IR-2 (Hunters Point Community Relations Program documentation). Fill operations in this area had reclaimed substantial portions of land from the bay by 1943.

Review of a subsequent photograph titled "Uncontrolled Mosaic of Hunter's Point - Utility Squadron One" (March 30, 1945), not reproduced herein, indicates that the marsh area formerly located landward of the subject property had been completely reclaimed and developed as housing for Hunters Point personnel. Approximately half of that portion of the property located within the area defined by the Navy railroad right of way, Armstrong and Yosemite Avenues, and Hawes Street had been filled. The scale of the photograph does not allow for detailed inspection of the fill material.

5.2 Photograph 2-87 GS-CP (7-29-46)

Examination of this photograph illustrates that a substantial portion of the subject property had been filled, including the area of known contamination and most of the area inclusive of Hawes Street and Yosemite and Armstrong Avenues. Despite the poor definition of the photograph, features observable within the subject property include 1) an apparent access route for traffic oriented parallel to the South Basin Canal, 2) a large area of dark staining which includes a portion of the area of known contamination, and 3) an apparent runoff channel situated between the boundary of the A.D. Schraeder yard and the subject property.

Several source areas for contamination at Hunters Point are also evident on the photograph, including the aforementioned bay fill area (IR-2), early fill operations in the area of the industrial landfill (IR-1), oil reclamation ponds (IR-3), a scrapyard (IR-4) and a transformer storage yard (IR-5).

5.3 Photograph AV-17-12-15 (7-28-48)

The resolution of the 1948 photograph allows for close inspection of the subject property and vicinity. A route of ingress and egress to and from the property is observable. Two trucks are observed in the process of leaving the site. The large area of dark staining, visible on the above referenced photograph and roughly coincident with the area of known contamination, appears to be full of debris and material, including items such as lifeboats and rafts, and wood or metal scrap. An enlargement of the subject property area, not reproduced herein, was also examined. Examination of the enlargement appears to indicate that a depression may have been present in the area of known contamination. Material or liquid within the depression is highly reflective, or shows a distinct mottling and/or interplay of alternately highly light absorbing and light reflecting liquid or material. A partially filled, dark stained runoff channel is also visible. Drainage of the channel to the bay appears to be obstructed by a mound of fill.

5.4 Photograph 4VV5RTM 2128 5SRG (1-30-51)

Examination of this photograph suggests that a substantial increase in fill activities occurred in the South Basin Channel area between 1948 and 1951. The fill area northeast of the subject property on the opposite side of the channel had been considerably expanded, and fill areas appear graded. Soil stockpiles are also present, suggestive of final filling and grading activities.

The subject property likewise shows signs of filling and grading, although activities appear to have been preliminary in scope. The area of known contamination, formerly an apparent depression, appears to have been filled to approximate grade. Fill and dumping activities appear to be concentrated in an area in closer proximity to the present position of Griffith. A burn area and an apparent pit are observable outside the approximate limit of the subject property. The location of the pit is roughly coincident with a portion of the area presently defined by the intersection of Armstrong Avenue (extension) with the above referenced Tide Land Commission railroad right of way, presently zoned for public use, and apparently owned by the city.

5.5 Photograph VV 302 TRS M 553 TAC 10 FEB 53 302/60 S-24 (2-10-53)

Examination of the subject property indicates that the portion of the property adjacent to the Navy railroad, including the area of known contamination, had been filled to grade and graded. Two apparent fenced enclosures are present. Routes of ingress and egress to and from the property are well defined. The area southeast of the present location of Hawes Street is occupied by several automobiles. The above referenced pit was still present on the adjacent property.

The photograph also shows the significant expansion of the Hunters Point complex which occurred in the early 1950s. The location of several of the Hunters Point source areas are indicated on the photograph.

5.6 Photograph AV 170 08 14 (5/5/55)

As seen on the photograph, the subject property had been completely filled and graded. The lumberyard which subsequently occupied the site is under construction. There is no visible evidence of contamination. An apparent storage area or junk yard for automobiles is located adjacent to the subject property.

5.7 Subsequent Aerial Photography (1957)

An aerial photograph derived from Gabriel Moulin Studios (negative number 14117-2, dated 9-12-57), not reproduced herein, provides an oblique view of the operating lumberyard. Two structures and stockpiled lumber are observable. The structures appear to be warehouses used for the delivery and storage of lumber. No processing operations are discernable. Adjacent property across Armstrong Avenue (extension) appears recently graded. Some refuse, and an area of discoloration, are observable along the bay margin outside the area of the subject property. The former Yosemite Pumping station is also visible in the photograph.

5.8 Site Accessability

To the extent permissable given limitations of scale and clarity of the aerial photographs, it may be qualitatively observed that access to the site from various directions, including Hunters Point Naval Shipyard and the associated industrial area, as well as other avenues and thoroughfares apparently not connected to Hunters Point, changed through the time period under examination (1939 - 1957).

In 1943, the site was primarily under water and fill operations had only recently been completed for construction of the railroad spur and access road. Examination of the 1946 photograph indicates that access to the property was apparently restricted to the Navy railroad right of way and access road. By 1948, however, access to the site appears to have been available via both Armstrong Avenue and the Navy access road. The Armstrong Avenue ingress appears heavily travelled in the 1951 photograph, with subordinate indications of transport along the Hunters Point road. Dual access is again apparent in the 1953 photograph and, with significant fill operations commencing elsewhere along South Basin, the Hunters Point railroad access route appears more heavily travelled than in 1951. By 1955, several access routes to the entire South Basin area appear to have been established.

5.9 Summary of Aerial Photography

The subject property appears to have been under water until approximately 1943. The subject property emerged from the bay in 1945-1946 and was gradually filled until 1957. Within the approximate confines of the area of known contamination beneath the subject property, no visible indications of environmental contamination appear to be identifiable in the aerial photographs dated from 1951 onward.

To the extent ascertainable, fill operations which resulted in early emergence of that portion of the subject property which is underlain by the known extent of contamination may have been associated with operations at Hunters Point. It is noted that access to the site, located bayward of the Navy railroad right of way and access road, appears to have been restricted until approximately 1946 - 1948. As discussed in a previous section, the contents of the artificial fill, including significant amounts of ship rigging and cables, large quantities of stainless steel, canteens, hospital waste including bedpans, IV bottles, and empty pharmaceutical bottles, jeep tires, metal shop waste, railroad carts and waste, metal drums and containers occasionally containing a waste oil - like liquid, and large quantities of hot water heaters, suggests that the early fill operations derived material from the naval operations at Hunters Point.

By 1948, however, access to the site appears to have been available from several sources, and post-1948 photographs suggest a significant amount of transport to the site occurred along roadways other than the Hunters Point railroad access road. Source areas apparently located outside the area of the subject property, identified from aerial photography of the early 1950s, may consequently have been derived from the activities of unidentified parties.

Pertaining to the known extent of subsurface contamination, as ascertained from the exploratory work performed by ERM-West (discussed below), it appears that the configuration of a portion of the contamination plume closely approximates the former border of the A.D. Schraeder railroad yard. Review of oblique and overhead aerial photography suggests the area adjacent to the A.D. Schraeder fence line may have been characterized by a large depression of irregular morphology and topography, which may have extended up to 100 feet into the subject property. Dark staining observable on several photographs suggests that additional contamination may be present beneath the subject property in the vicinity of the area of known contamination. It is further noted that an apparent runoff channel appears to have been situated between the boundary of the A.D. Schraeder yard and the subject property, and may have contributed to discharges of liquid to the bay.

6.0 EXTENT OF SEWER UTILITIES PRIOR TO 1987

The construction and operation of sewer utilities prior to 1987 may potentially have contributed to the presence and/or migration of contamination beneath the subject property. Two sewer facilities were previously located in the vicinity of the subject property. The Yosemite Pumping station was previously located near the head of the South Basin Canal, at the intersection of Ingalls Street and Yosemite Avenue (Plate 12). The sewer apparently discharged treated effluent to the South Basin Canal, located adjacent to the subject property. In 1966, a sewer lateral was constructed along Armstrong Avenue by McGuire and Hester, contractor for the City and County of San Francisco.

6.1 Discharges by Southeast San Francisco POTW

A table of average effluent concentrations from the 1982 NPDES Compliance Monitoring Reports for the San Francisco - Southeast Publicly Owned Treatment Works (POTW), presented in "Toxics in the Bay" (Citizens for a Better Environment, Report 83860, December 19, 1983), indicates that significant quantities of metals, phenols, and oil and grease were discharged as final treated effluent to the Bay from the southeast POTW.

6.2 Construction of 1966 Sewer Lateral

The location of the 1966 sewer lateral is shown in Plate 12, Attachment A. The approximate known extent of contamination beneath and adjacent to the subject property (modified from ERM-West, 1987) is superposed on the construction plan for the sewer lateral (City and County of San Francisco, 1966). Although the exact depth of construction of the sewer is not know, it is likely that the sewer and backfill material intercepted the subsurface contamination and, consequently, the presence of the sewer may have provided for potential lateral migration of the subsurface contaminant plume along Armstrong Avenue.

7.0 YFOC PROJECT INVESTIGATION (ERM-WEST, 1987)

As shown in the construction plan of Plate 13, Attachment A, the YFOC project in the vicinity of the subject property included construction of a 66-inch diameter sewer along Armstrong Avenue, and construction of a 17 to 40 foot wide outfall basin along Hawes Street, Yosemite Avenue and across ~~the~~ Yosemite (South Basin) Canal. Plans presented in GCI (1985) indicate that the base of the 66-inch diameter sewer constructed along Armstrong was to be placed at an approximate elevation of (-)23 feet (sfcd). The same plans indicate that the outfall basin was to be placed at an approximate depth of (-)26 feet (sfcd). As built plans for the YFOC project have not been obtained in the course of this investigation.

The consulting firm ERM-West was retained by the City and County of San Francisco to evaluate the presence or absence of contamination in the area of proposed construction for the YFOC project. In the area of the subject property, the ERM-West investigation was primarily concentrated along Armstrong Avenue and Hawes Street. Minor subsurface exploration occurred on Yosemite Avenue. The following summary of the ERM-West investigation is taken from Baseline Environmental Consulting (1987).

ERM-West collected soil and groundwater samples for the city in November, 1986. Sampling locations are shown in Plate 14, Attachment A. Seven boring locations are located on Armstrong Avenue and four boring locations are located on Hawes Street. Two boring locations are present on Yosemite Avenue. Three monitoring wells, designated OW-1, OW-2 and OW-3, were also installed on or near the subject property. Data submitted to the city by ERM West are, as stated in the Baseline (1987) report, "incomplete and inconclusive as to the location and source of compounds identified in the subsurface". Analyses were performed on soil and groundwater samples from locations 7, 7A, 8 and I. In addition, the Baseline (1987) report indicates that, according to verbal communication with ERM-West staff, soil borings along Armstrong Avenue were not sampled, but rather were visually examined for soil discoloration and floating product on the groundwater table.

7.1 Analytical Results

Analytical results from the ERM-West (1987, 1987a, 1987b) reports are summarized in Tables 2 and 3 of Attachment B, for Borings 7A and 8. The analytical data for Boring I has not been compiled due to apparent inconsistencies observed in the data. In addition, analytical data is reported to be available for Borings T, W, and Wells OW-1, OW-2 and OW-3 (Baseline, 1987). The latter data has been requested from the City and County of San Francisco by Amen, Keith & Berg, but had not been received prior to compilation.

7.1.1 Data Validity

Some of the analytical data presented in the available ERM-West documents appears to have been generated from composite samples. The compositing appears to have occurred under uncontrolled field conditions. Further, sample chain of custody documentation and a detailed description of sampling protocol are not available.

7.1.2 Soil Analytical Data

The analytical results indicate that soil contamination by organic compounds has occurred in the subsurface at Location 7A, with Total Petroleum Hydrocarbon (TPH) concentrations in soil of 680 milligrams per kilogram (mg/kg), or parts per million (ppm). A sample of "black ooze", which may be assumed to be a portion of the floating product, collected at location 7 was analyzed for creosote and pentachlorophenol. These constituents were not detected above the instrument detection limit of 10 mg/kg. *

Soil samples from locations 7 and 8 were also collected and analyzed for metal inorganic constituents. Potentially elevated concentrations of several metal constituents were detected. The zinc concentration exceeds the California Code of Regulations (CCR) Title 22 Total Threshold Limit Concentration (TTLC) criteria for designation as a hazardous waste. *

7.1.3 Groundwater Analytical Data

Water from the open borehole of 7A was sampled and analyzed for benzene, toluene, ethylbenzene and xylene (BTXE), chlorinated aliphatic hydrocarbons (purgeable halocarbons), and polycyclic aromatic hydrocarbons (PAHs). Total PAHs were present in concentrations of 8.35 milligrams per liter (mg/l), or ppm. Benzene, toluene, xylene and 1,1 dichloroethene (1,1-DCE) were also detected.

Groundwater samples collected at well locations OW-1, OW-2 and OW-3 (Plate 14) were analyzed for TPH, PNAs and polychlorinated biphenyls (PCBs) (at location OW-3). According to Baseline (1987), the highest concentrations of TPH and PNAs were detected at OW-3. PCBs were apparently not detected above the instrument level of detection.

NO? per Precision Lab results 3.7 ppm PCB.

7.2 Extent of Contamination Defined by ERM-West

Based upon organoleptic and analytical indications of contamination, ERM-West delineated the area of approximate contamination present in the area of Armstrong Avenue and Hawes Street as shown in Plate 15. Additional areas of contamination may be inferred outside the area. For example, review of ERM-West drilling logs indicates that organoleptic indications of contamination were apparently detected during drilling of Boring D, approximately located as shown in Plate 14.

8.0 ADDITIONAL ANALYTICAL RESULTS

Baseline Environmental Consulting collected soil samples at Brush Lumber Company, located at the former A.D. Schraeder property across Armstrong Avenue from the subject property. Samples were analyzed for TPH, PAHs and creosote. TPH concentrations ranging from 83 to 180 ppm were detected in three of the ten locations sampled. Total PAH concentrations ranged from <0.1 to 2.2 ppm. Creosote concentrations were apparently not detected. According to Baseline (1987), an underground storage tank was formerly located at the Brush Lumber property. An unauthorized release was detected during closure activities and a monitoring well was installed by the contractor. No compounds were detected in a groundwater sample collected by the contractor and submitted for analysis of BTXE.

8.1 Monitoring Well OW-3

At the request of the owner of the subject property, a sample of liquid from Well OW-3 was collected and submitted to Precision Analytical Laboratory, Inc. by L&W Environmental in June, 1989. The sample was analyzed for PCBs, halogenated hydrocarbons and metals. The Certified Analytical Report is presented in Attachment D. PCBs were detected at 3.7 ppm, reported in mg/kg. Halogenated hydrocarbons were not detected. Detectable levels of antimony, zinc, lead, cobalt, copper, nickel, chromium, vanadium, copper and barium were also present in the sample.

9.0 DOCUMENTATION AND IMPACT OF CONSTRUCTION ACTIVITIES

Review of photographs taken during construction of the YFOC project document that significant indications of contamination were encountered during excavation along Armstrong and Hawes. In addition to the inventory of military hardware, construction debris, hospital waste, scrap metal and drill cuttings, stainless steel and railroad material noted in a previous section, photographs show 1) liquid waste draining from voids within the artificial fill following excavation, 2) metal drums, crushed or cut during excavation, draining liquid waste, and 3) apparent commingling of floating product(s) within the submerged trench excavation.

According to the owner of the subject property, initial efforts to remove contamination prior to construction included a groundwater extraction program. Due to the fine grained nature of the artificial fill and younger bay mud, the effort was largely unsuccessful. Contaminated soil was therefore excavated and stockpiled on plastic. Contaminated groundwater was apparently pumped to large capacity Baker tanks from two wells located along Armstrong Avenue.

The owner of the subject property has indicated that the project encountered considerable delays due to the contamination problem. During later phases of construction, proper waste handling protocol may have been circumvented in the interest of meeting the demands of the construction budget and schedule. Circumvention of protocol included pumping of contaminated groundwater directly to the sewer, as observed in available photographic documentation, and installation of the sewer conduit directly into floating product and contaminated groundwater, followed by backfilling operations. During a subsequent construction phase involving installation of catch basin near the intersection of Hawes Street and Armstrong Avenue, a large metal container filled with a waste oil like product was breached but left in place.

To the extent, <u>arguendo</u>, that the remediation activities may have mitigated contamination present in the subsurface of the public right of way, one can not conclude that the subject property was not negatively impacted by subsequent construction of the sewer and associated backfill. It is apparent that construction activities clearly contributed to the release of additional contaminants into the substrate. Further, the backfill surrounding the concrete culvert is composed of porous material with an inferred high hydraulic transmissivity. It is noted that ERM-West recommended construction of baffles within the porous backfill to inhibit lateral transport of contamination. Photographs of backfilling operations indicate that this recommendation was not implemented. Consequently, lateral migration of contaminants within the backfill may potentially occur, allowing for a substantial increase in the probability for accelerated migration and dispersion of contaminants along the perimeter of the property by advective transport and other contaminant transport processes.

10.0 REGULATORY CRITERIA

The limited data available for the subject facility precludes detailed discussion and comparison of contaminant levels with applicable regulatory rules, regulations, guidelines and advisories. A brief overview is provided herein.

10.1 Regulatory Rules

A discussion of regulations contained within the federal hazardous waste regulations including the Resource Conservation and Recovery Act (RCRA), the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Superfund Amendments and Reauthorization Act (SARA) is beyond the scope of this document. With reference to the Superfund legislation, it is noted that Superfund provides for strict, joint and several liability among responsible parties who can be required to finance cleanup activities. It is also noted that 1) the EPA has applied provisions of the law to allow responsible parties who made only minor contributions to contamination to sign de minimus settlements under which they agree to contribute a small, fixed amount to cleanup costs. On May 30, 1989, EPA also formalized arbitration procedures for allocating response and cleanup costs when total costs do not exceed $500,000.

Review of the available data suggests that a discussion is appropriate concerning regulatory rules contained within CCR Title 22, pertaining to hazardous waste criteria, and the Porter Cologne Water Quality Control Act, pertaining to discharges to waters of the state.

10.1.1 CCR Title 22

Future investigative and remedial activities at the subject property will require careful adherence and review of hazardous waste regulations contained within CCR Title 22. Fundamental definitions of what constitutes a hazardous waste, as set forth under Articles 9 and 11 of CCR Title 22, and the applicability of such criteria as cited under Article 2, should be adhered to for declassification of any waste as nonhazardous. Pursuant to 22 CCR, Section 66300 (a) (1), any waste determined to be hazardous according to any of the criterion in Article 11 and consists of or contains a material cited under Article 9 shall be handled as a hazardous waste.

10.1.2 Porter Cologne Water Quality Act

Following review by legal counsel of the provisions set forth in Sections 13271 and 13272 of the Porter Cologne Water Quality Control Act, appropriate further notification may be provided by appropriate parties to the RWQCB and initial notification should be provided to the Office of Emergency Services.

The RWQCB may eventually require monitoring and investigation of site conditions in accordance with Water Code Section 13267 (a) and (b). Further requirements may be ordered in accordance with Section 13304, in the event that the conditions under which Section 13304 may be implemented are germane to the site.

10.2 Comparison of Data to Applicable and Relevant Standards

The paucity and questionable veracity of available data places severe constraints on relevant opinion and commentary. Review of the highly limited chemical data suggests that a low probability exists that observed concentration levels of some site soil and groundwater constituents may exceed some applicable and relevant standards pertaining to hazardous waste criteria, permissible exposure levels or ambient water quality criteria. One observed concentration of zinc, for example, exceeded the TTLC value for designation as a hazardous waste.

Preliminary review suggests that DCE, benzene, PCBs, benzo[a]pyrene, nickel, lead and chromium levels may exceed potentially applicable advisory levels, such as the EPA advisory level for ambient water quality criterion (AWQC), designated for the protection of human health from the toxic properties of a constituent ingested through water or contaminated aquatic organisms. It is noted that the referenced standard is an advisory level and may not be an enforceable

standard.

11.0 HEALTH AND ECOLOGICAL RISK

At most contaminated waste sites, a final decision regarding the appropriate remedial action, including the "No Action" alternative, is guided in part by an evaluation of health and ecological risk. The risk assessment process is complex and is generally accomplished using an adequate data base and statistically defensible uncertainty analysis. The data paucity of the subject site would not allow for a detailed risk evaluation. A risk assessment was nonetheless performed for the site assuming that available concentration data represented maximum, "worst case" conditions for the site. The detailed assessment is provided in Attachment E.

11.1 Summary Of Health-Ecological Risk

The preliminary risk assessment provided in Attachment E suggests that there may be some adverse effects to marine and human life as a result of exposure to some toxic substances from the Armstrong/Hayes area. However, it should be emphasized that for a health risk to occur, a route of exposure (inhalation, dermal adsorption, ingestion) must be present. The contaminants of greatest concern appear to be lead and chromium. However, the available data are much too sparse to provide a true quantitative risk assessment. The preliminary risk assessment is not statistically defensible, and certain assumptions made in the assessment of risk may be subject to critique. Further, pertinent information necessary for the health risk evaluation, such as valence states of elements and the sensitivity of the chemical analytical method employed, do not allow for strict quantification.

12.0 SUMMARY

The property is underlain by artificial fill, younger bay mud, and bay side sand to the depth explored by geotechnical investigations. The artificial fill and younger bay mud are generally considered to be potentially subject to structural instability, and extensive engineering design is generally recommended for structures constructed in such material.

Groundwater is located at less than three to five feet beneath the subject property. Tidal fluctuations may affect the groundwater flow direction and gradient. In addition, an upward (vertical) hydraulic gradient may be present in the general vicinity of the subject property.

A substantial portion of the subject property appears to have been located bayward of the line of mean high tide prior to 1942. A potential minor discrepancy may exist between the delineation of the mean high tide line as surveyed by Allardt (1868) and the shoreline as delineated in historic aerial photographs. A document addressing legal problems associated with jurisdiction of tidelands and marshes is provided as an attachment to this report.

The U.S. Navy condemned and took possession of lands adjacent to the subject property for the purpose of constructing a railroad to the Hunters Point Naval Shipyard in 1942. Initial review of court documents suggests that public access bayward of the U.S. Navy railroad right of way was restricted during the 1940s. Review of aerial photography for the period 1939 - 1957 indicates that that portion of the subject property known to be underlain by contamination emerged from the bay prior to 1948. Aerial photographs from 1946 and 1948 appear to indicate that the contaminated area was characterized by a shallow depression, which appears to have been filled with debris and may have contained ponded liquid. Access to the site appears to have been restricted to the railroad access road prior to 1948. In 1948 and subsequent years, access to the site may have been possible via one or more access points. By the time interval 1951-1953, the area of contamination was subject to final fill and grading operations. Based on review of aerial photography, the areal extent of contamination may be greater than currently defined. In addition, additional sources of contamination may be present in close proximity to the subject property, including an area approximately located within the confines of property owned by the State of California.

Excavation activities associated with the YFOC project exposed considerable construction debris, scrap iron, military hardware, naval rigging and hospital waste, as well as buried drums, waste oil, and liquid chemical waste. A newspaper clipping obtained from the excavation area places an approximate time stamp of 1945 on fill activities in the area of contamination. A qualitative association can be surmised between waste discovered in the YFOC project area and similar areas currently subject to environmental cleanup at Hunters Point.

Subsurface investigations and chemical analyses of soil and groundwater performed by ERM-West for the City and County of San Francisco indicate that 1) a large area of floating product is located under a portion of the subject property and 2) potentially elevated concentrations of metals, degradation products of chlorinated aliphatic hydrocarbons (notably 1,1- and 1,2-dichloroethylene), polycyclic aromatic hydrocarbons (PAHs), "waste oil", and benzene may be present beneath the property. Other laboratory analyses indicate concentrations of polychlorinated biphenyls (PCBs) may also be present beneath the subject property.

Photographic evidence suggests that construction activities associated with the YFOC Project contributed to the release of contaminants into the subsurface adjacent to the subject property. In addition, the porous backfill of the sewer and outfall basin may provide for accelerated advective transport and hydrodynamic dispersion of contamination around the perimeter of the subject property, and may provide for an exposure pathway to aquatic life in South Basin, if any.

The data paucity does not allow for a detailed discussion of appropriate regulatory criteria and guidelines. Discussions provided herein do, however, delineate appropriate sections of Title 22, California Code of Regulations (CCR), and the Porter-Cologne Water Quality Control Act.

A preliminary assessment of risk is provided in Attachment E. The assessment indicates that a low probability of risk to the environment or human health may exist, provided that no significant exposure pathway is present. The risk assessment is subject to considerable uncertainty due to the paucity of available and reproducible data.

DISCLAIMER

This assessment has been prepared in accordance with the accepted standards for environmental investigation at the time this investigation was performed. It should be emphasized that the statements herein are made with no specific knowledge of subsurface conditions aside from those described above. More extensive investigations, including a subsurface investigation and chemical testing, could reduce some of the inherent uncertainties associates with this type of investigation.

This report has been prepared for your exclusive use for this particular project. The opinions provided herein may not be relied upon by any other party unless otherwise expressly authorized in writing by Christopher M. French, R.G. No other warranties, expressed or implied, as to the professional advise provided, are made.

Should you have any questions, please call.

Very truly yours,

CHRISTOPHER M. FRENCH, R.G., R.E.A.

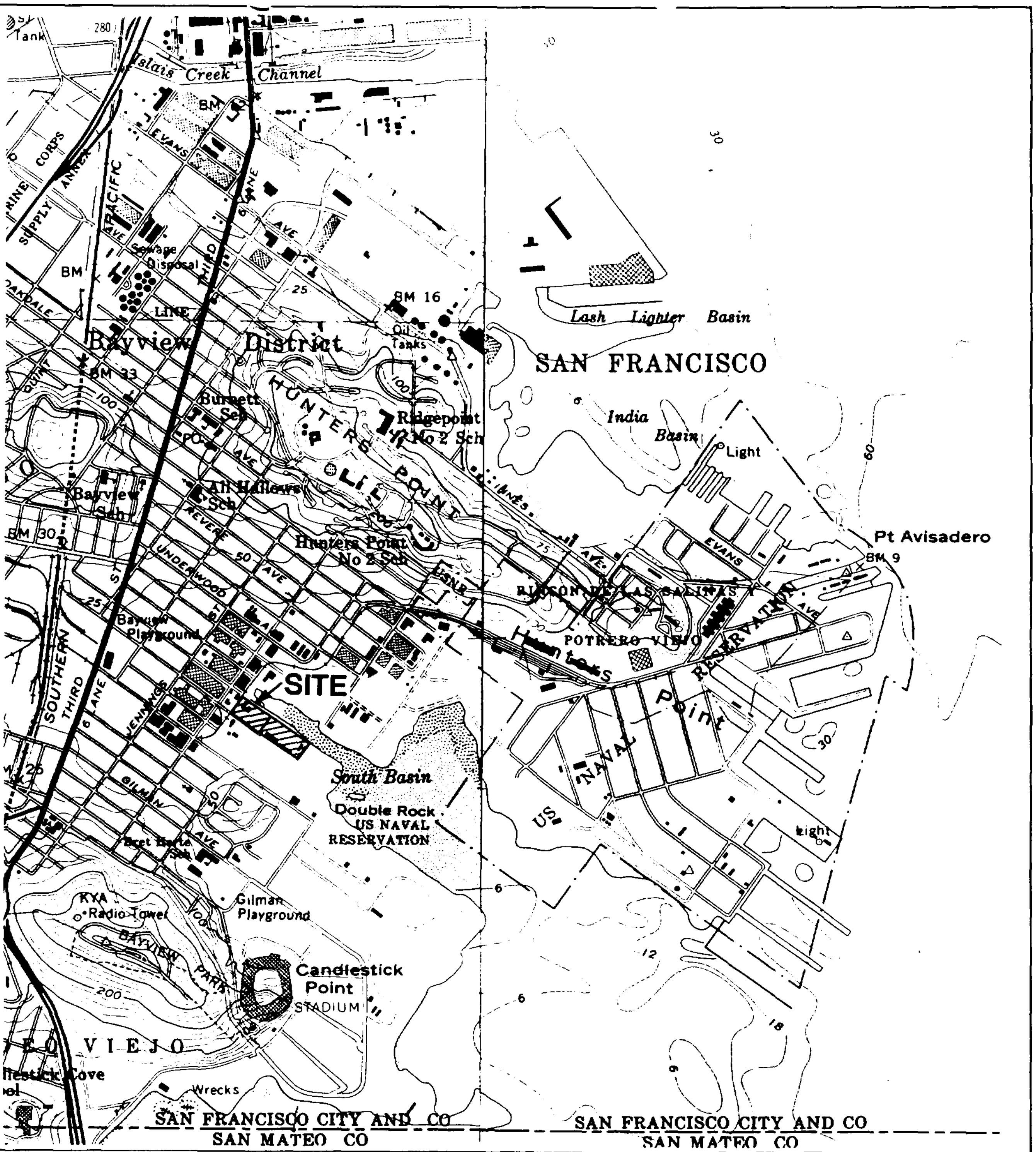
Christopher M. French, R.G., R.E.A.
Registered Environmental Assessor #307 (Exp. 6/30/90)

Jacques Guertin, Ph. D.
Associate Environmental Scientist

89-9001SA.I/CMF-JG/kn

Attachments

Attachment A
Plates



0 2000 Feet

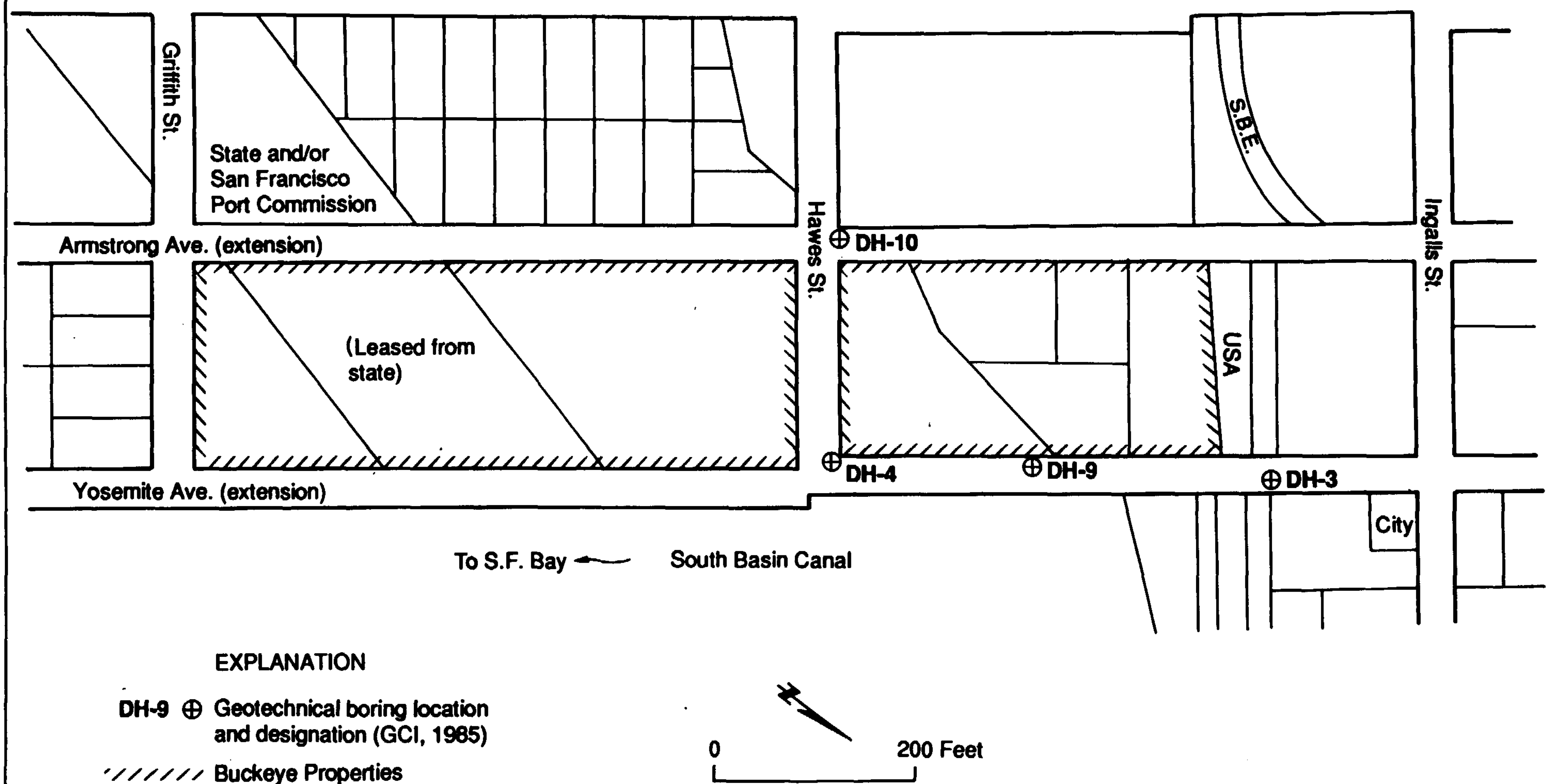
SITE LOCATION MAP

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Amen, Keith & Berg

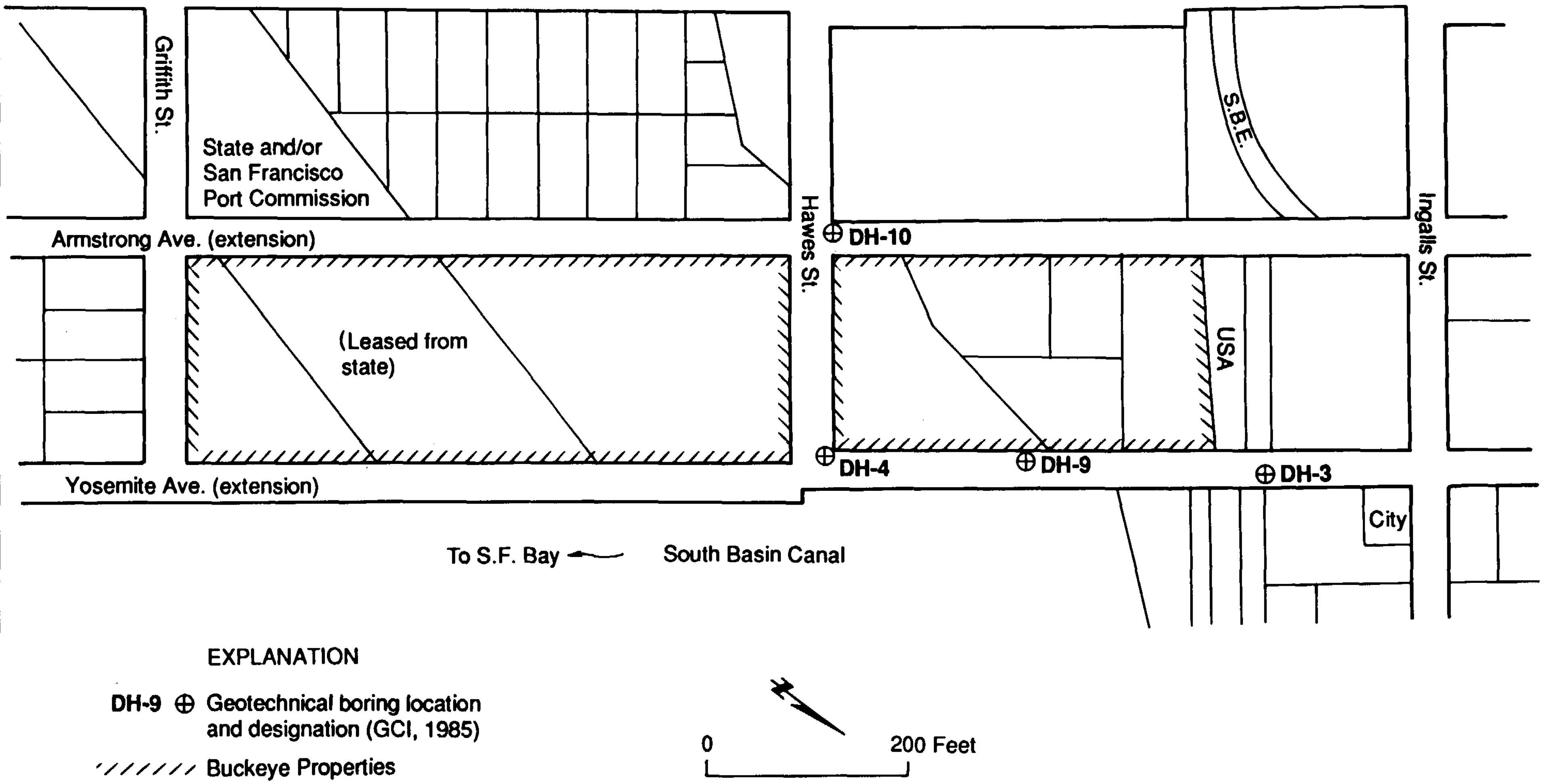
Job Number	Date	Plate
9011	11/89	1



Source: Larry Matthews Industrial Properties, Inc.

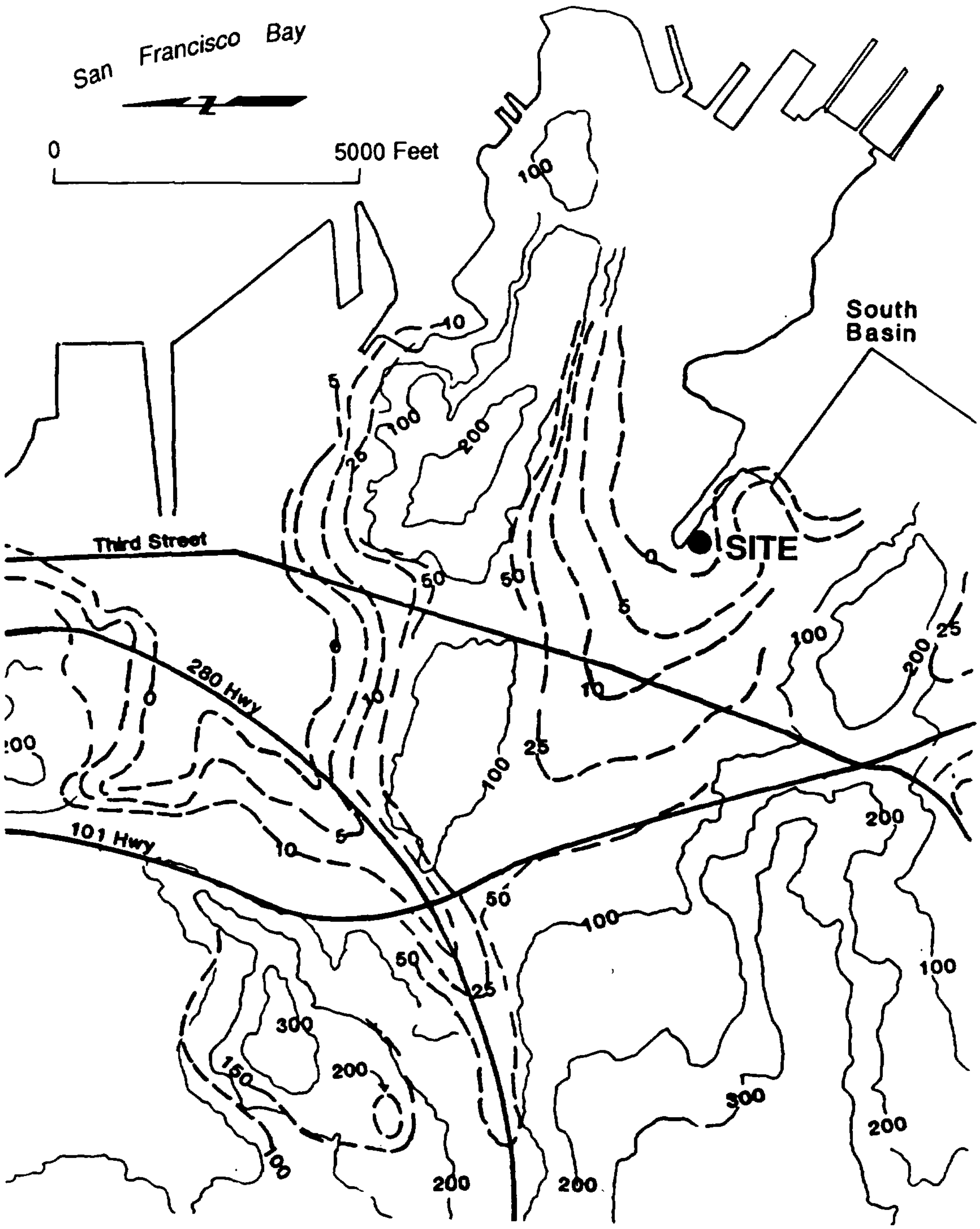
Christopher M. French, R.G. ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT	PLOT PLAN	Amen, Ke	
		Job Number	D.
		9011	11

Plot plan
GTI borin



Source: Larry Matthews Industrial Properties, Inc.

Christopher M. French, R.G. ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT	**PLOT PLAN**	Amen, Keith & Berg		
		Job Number	Date	Plate
		9011	11/89	2



EXPLANATION

— — 10 — — Groundwater contour with elevation in feet (S.F. City datum) City and County of San Francisco, 1989.

Reference: San Francisco County Hazardous Waste Management Plan. Draft EIR. 87.813E SCN#88050318

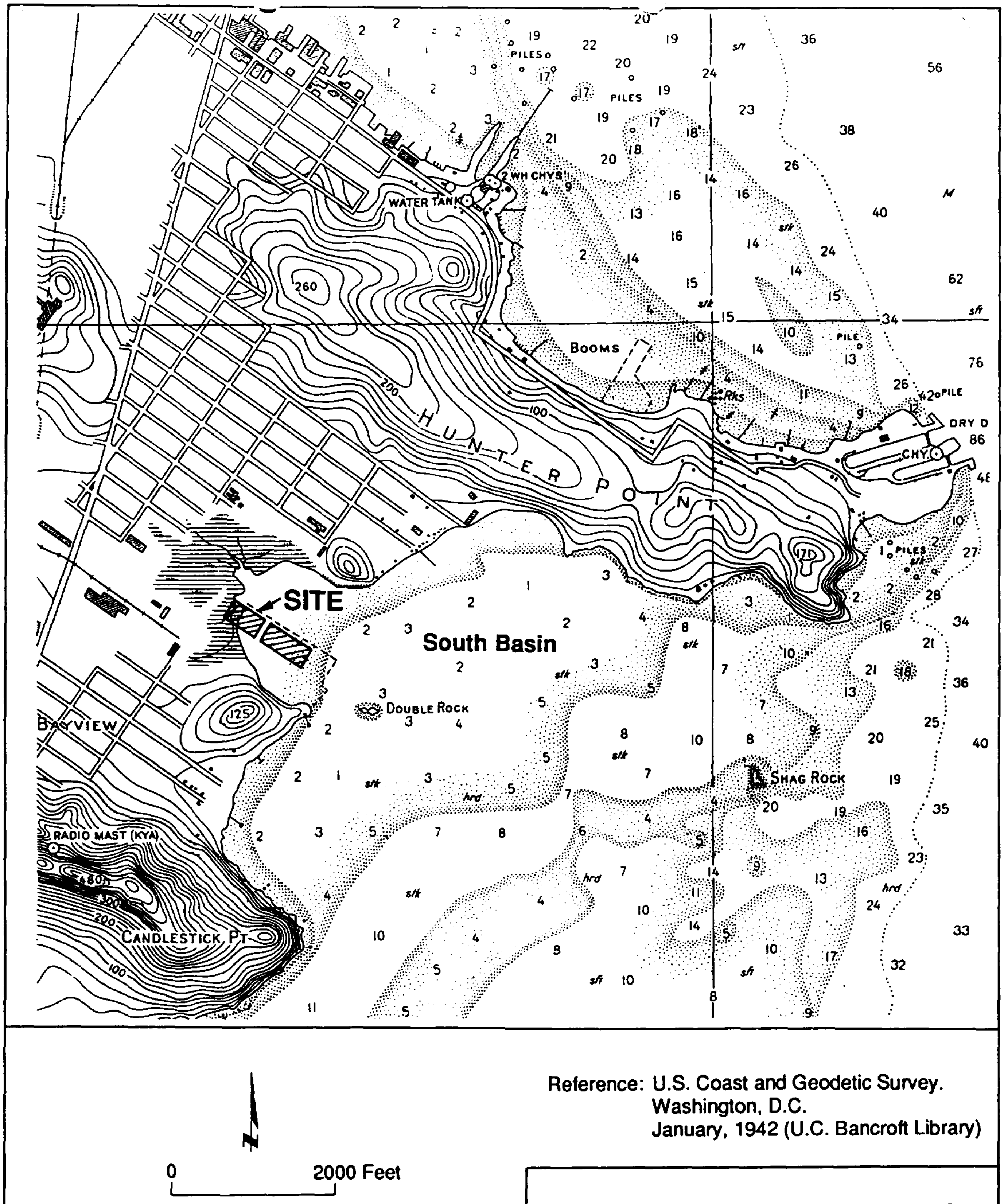
Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

GROUNDWATER CONTOUR MAP

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	3



Reference: U.S. Coast and Geodetic Survey.
Washington, D.C.
January, 1942 (U.C. Bancroft Library)

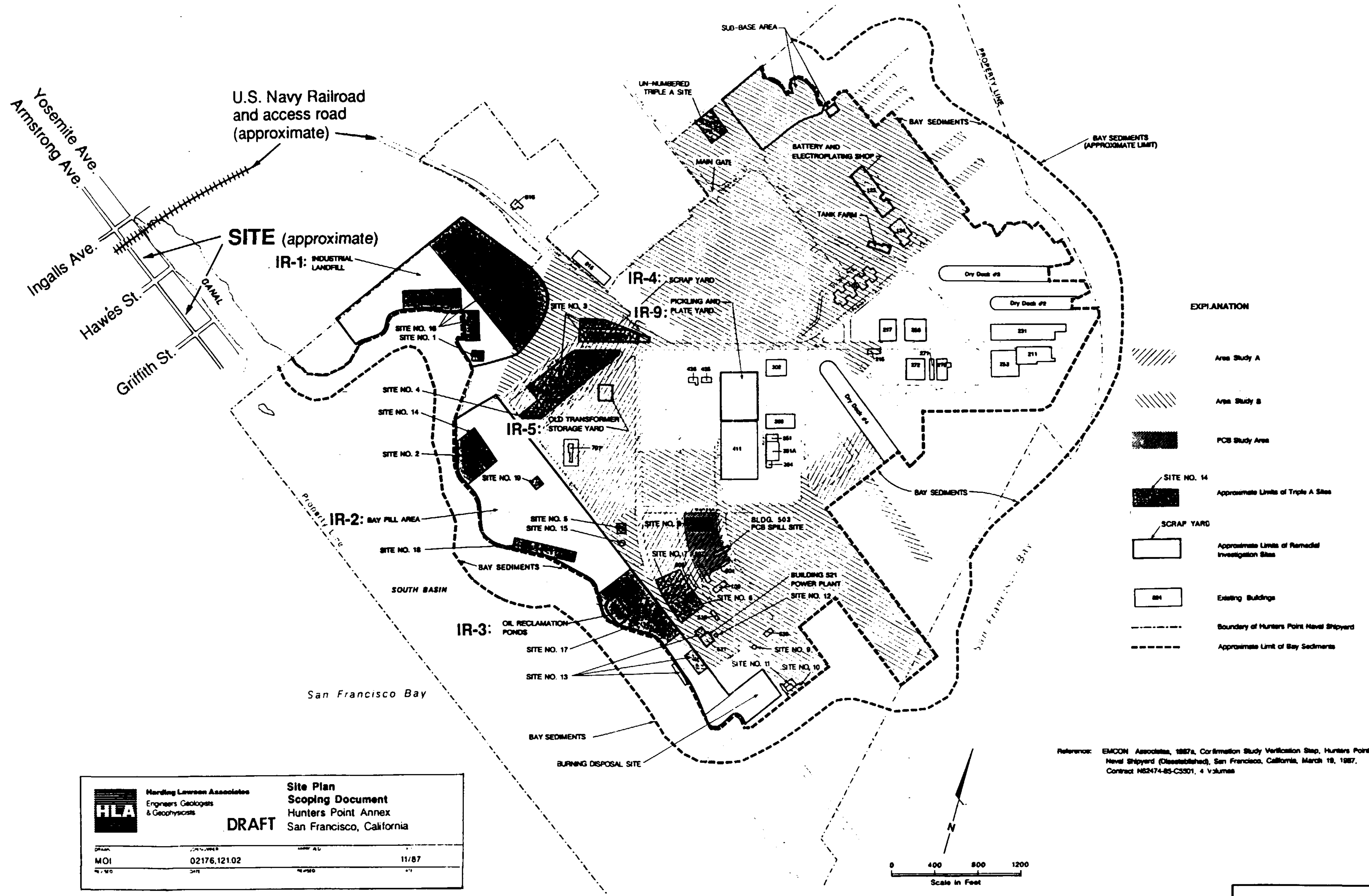
COAST AND GEODETIC SURVEY MAP (1942)

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	4



Source: Harding Lawson Associates. 1987.
Scoping Document
(San Francisco Public Library)

SOURCE MAP HUNTERS POINT

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	5

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

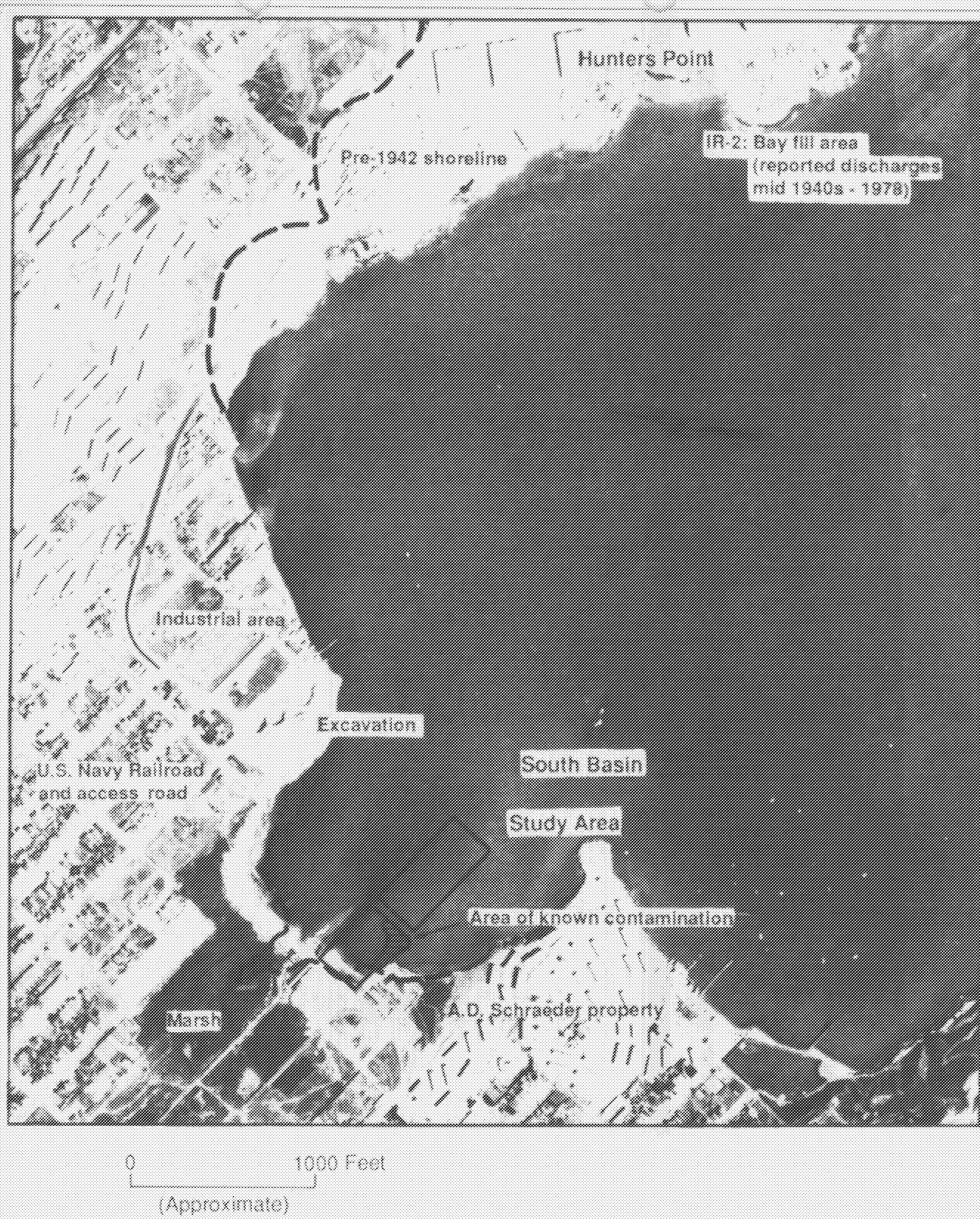


Photo base: National Archives,
Photograph DDB-2B-124,
10/11/43
Reference: Hunters Point Community Relations Program

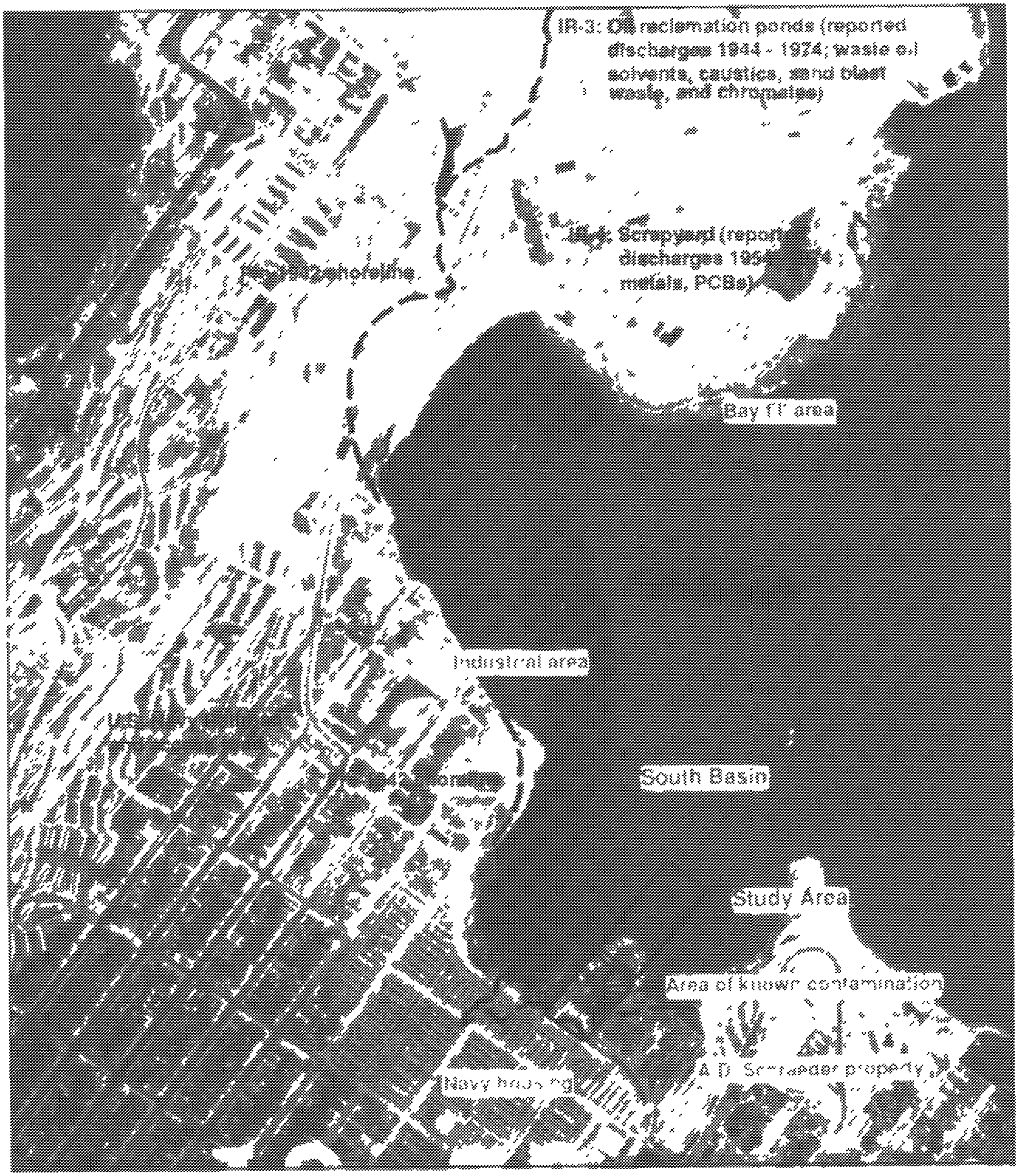
AERIAL PHOTOGRAPH
South Basin - Hunters Point
(1943)

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	6



AERIAL PHOTOGRAPH
South Basin - Hunters Point
(1946)

Christopher M. French, R.G.

Photo base: Pacific Aerial Surveys
Photograph AV-17-12-12
7/28/48

	AERIAL PHOTOGRAPH South Basin - Hunters Point (1948)
Christopher M. French, R.G. ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT	Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	8

AERIAL PHOTOGRAPH
South Basin - Hunters Point
(1951)

Christopher M. French, R.G.

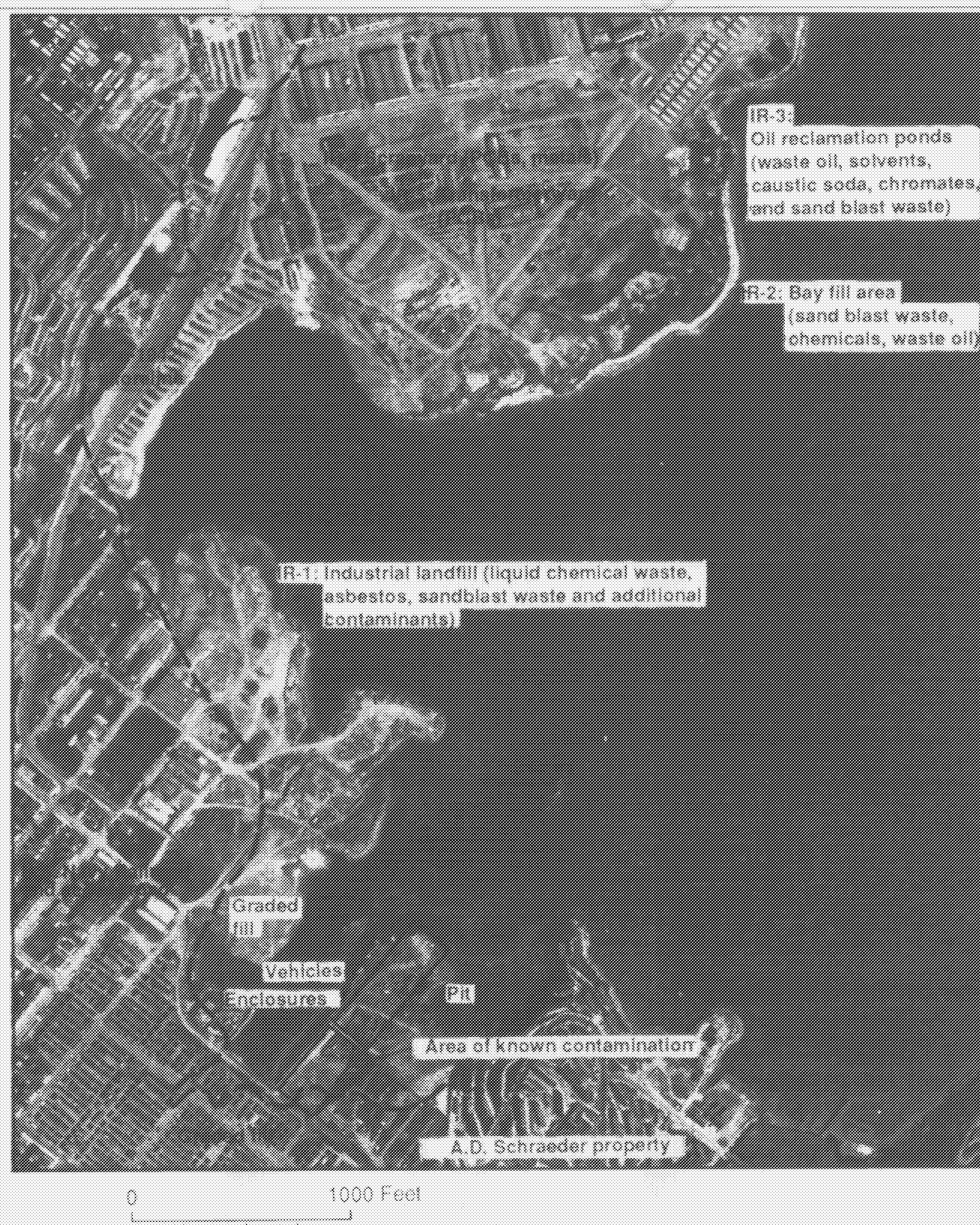


Photo base: National Archives.
Photograph VV302 TRS M 553 TAC, 10/2/53
302/60 S-24
Reference: Hunters Point Community Relations Program

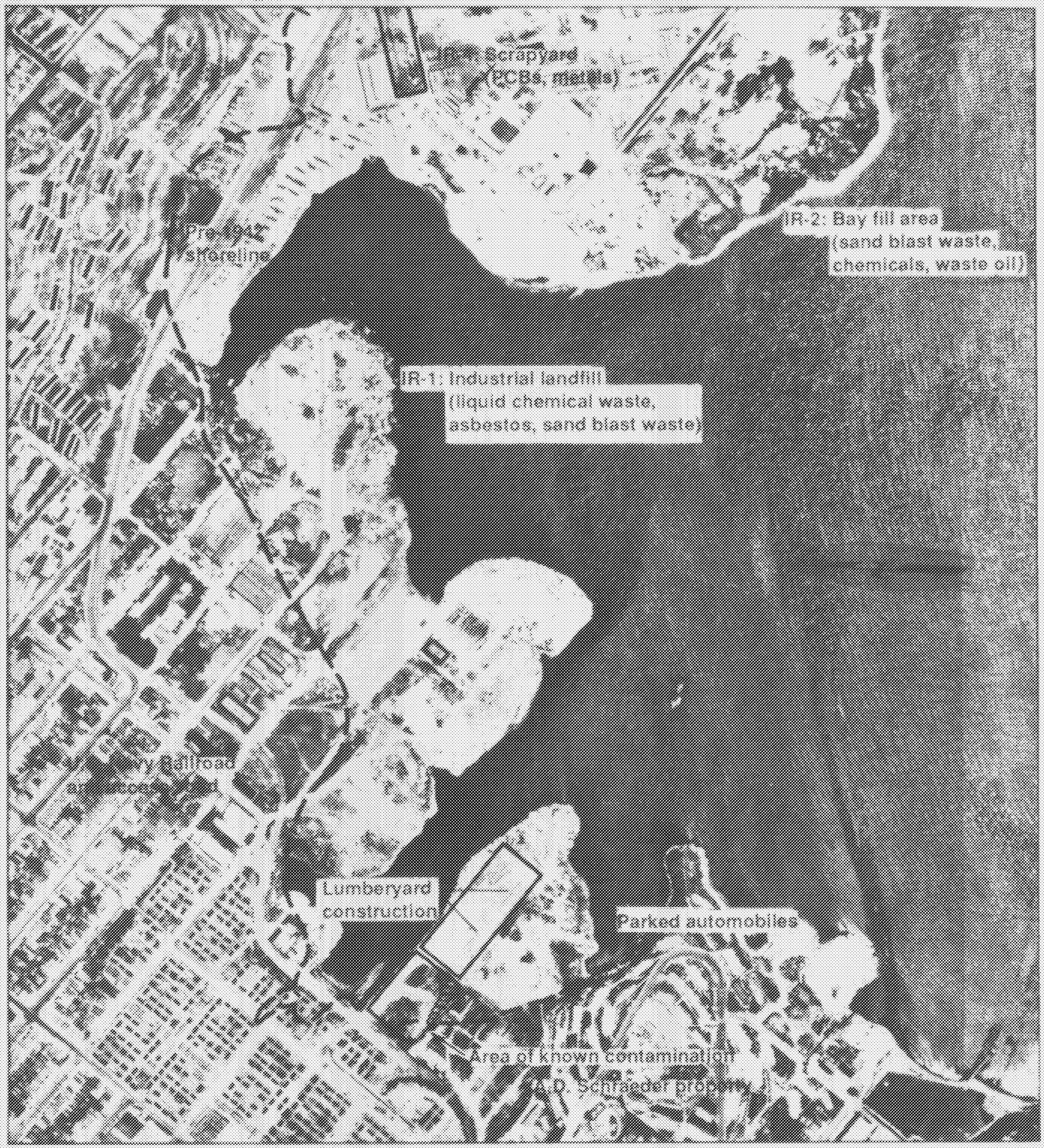
AERIAL PHOTOGRAPH
South Basin - Hunters Point
(1953)

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	10



0 1000 Feet
(Approximate)

Photo base: Pacific Aerial Surveys
Photograph AV-170 08 14
5/5/55
Reference: Hunters Point Community Relations Program

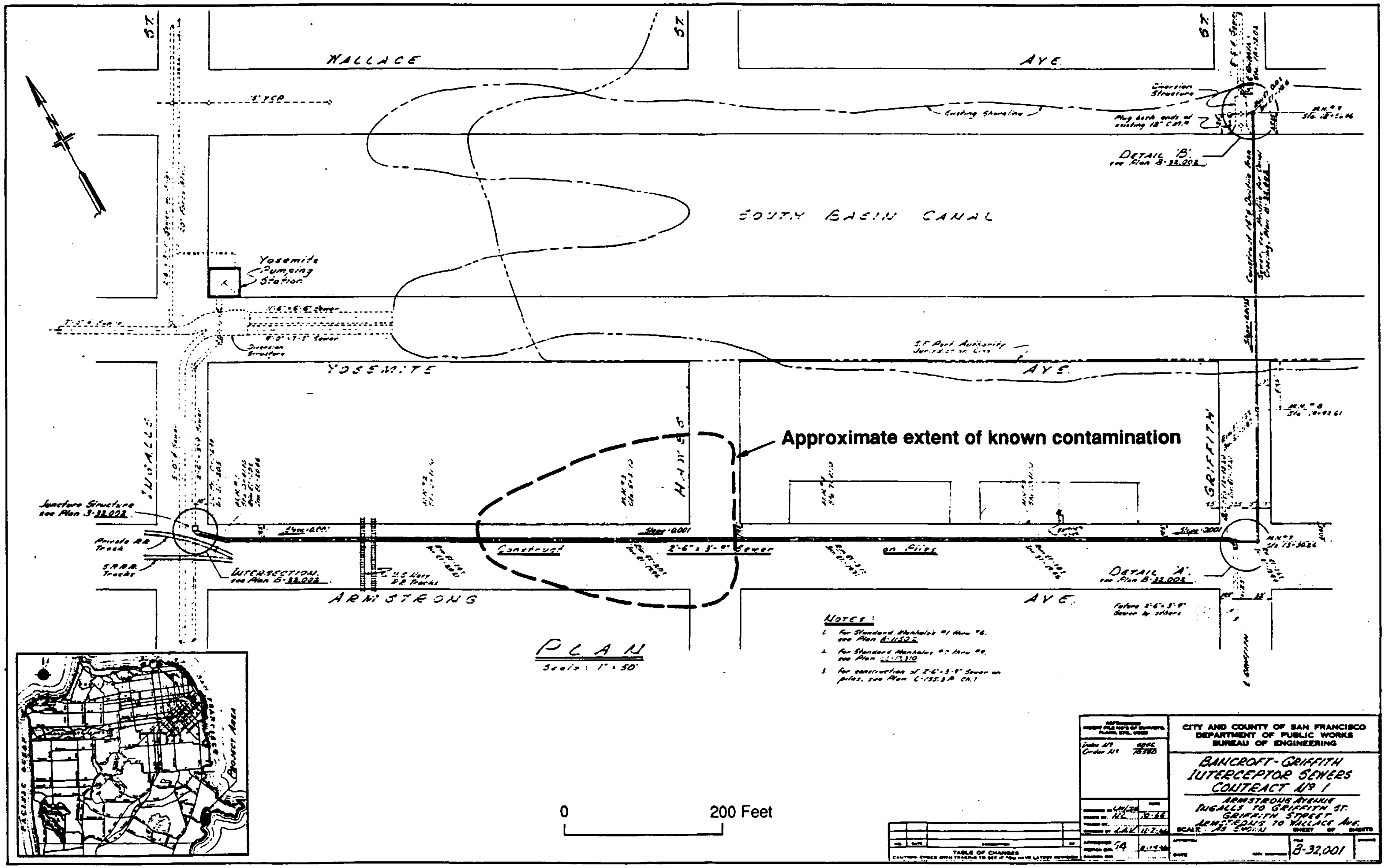
AERIAL PHOTOGRAPH
South Basin - Hunters Point
(1955)

Amen, Keith & Berg

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Job Number	Date	Plate
9011	11/89	11



Source: City and County of San Francisco, Department of Public Works

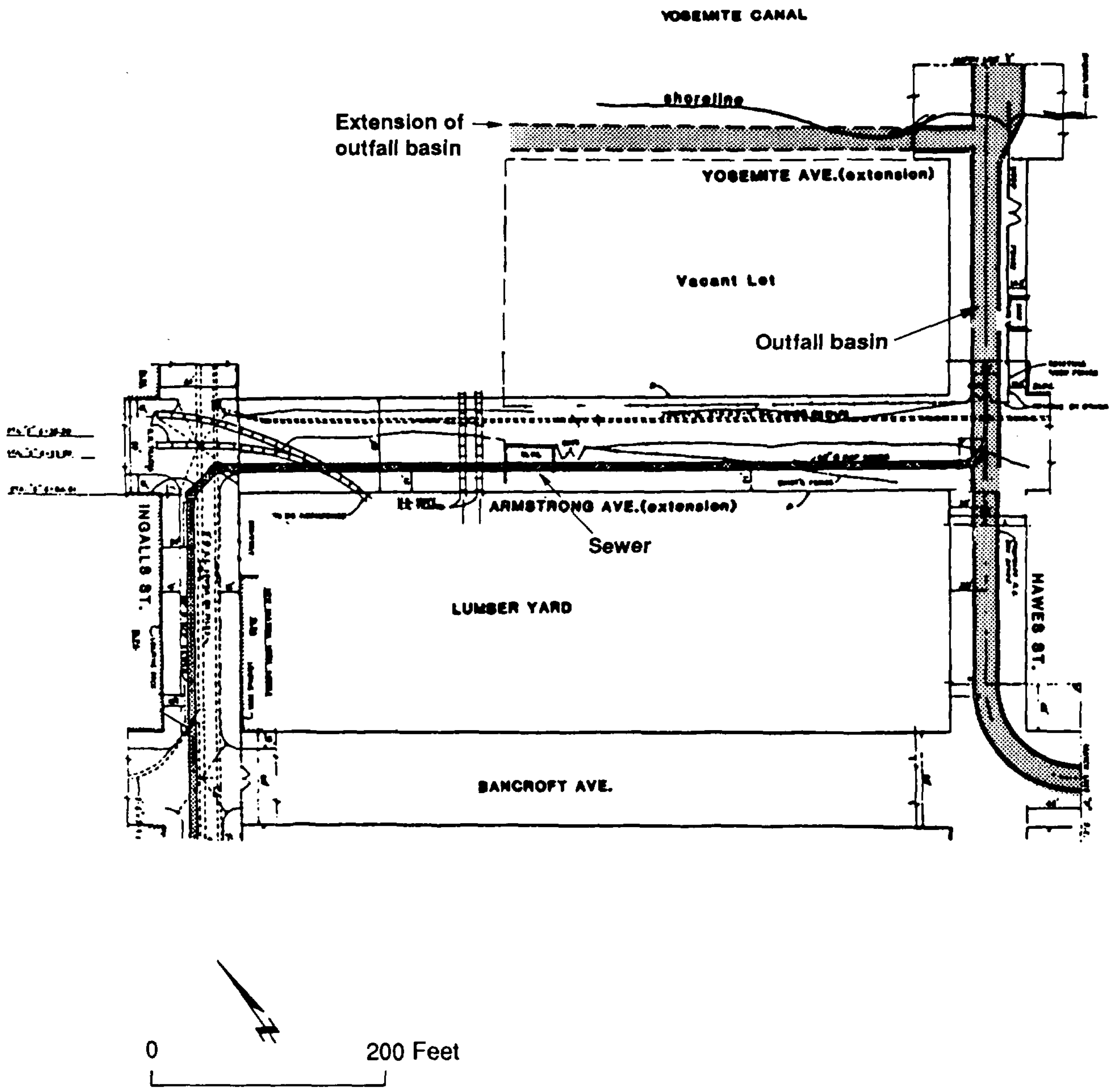
SEWER CONSTRUCTION PLAN (1966)

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	12

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT



Reference: ERM-West, 1987

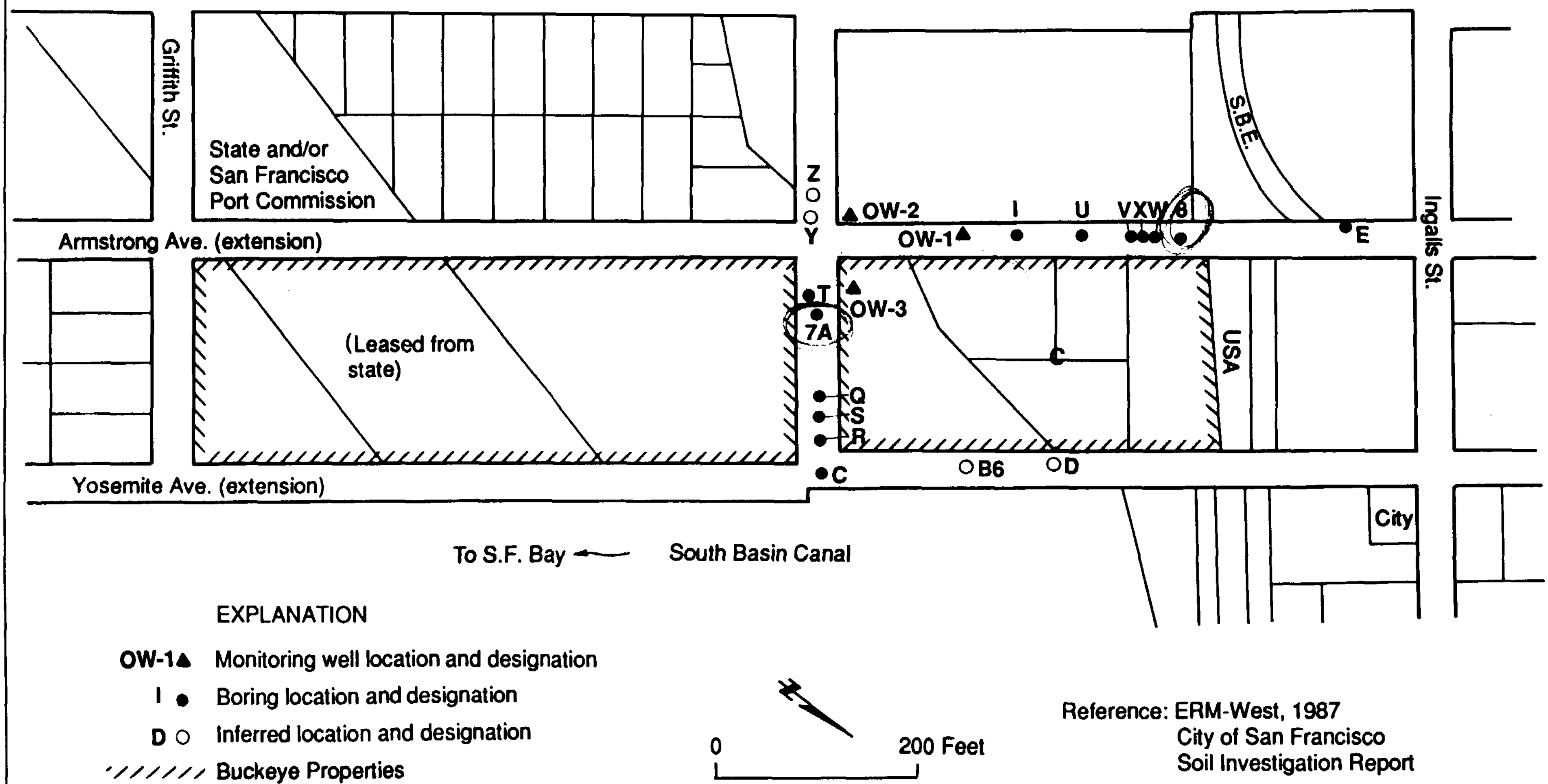
SEWER CONSTRUCTION PLAN (1986 - 1987)

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	13



EXPLANATION

OW-1▲ Monitoring well location and designation

I ● Boring location and designation

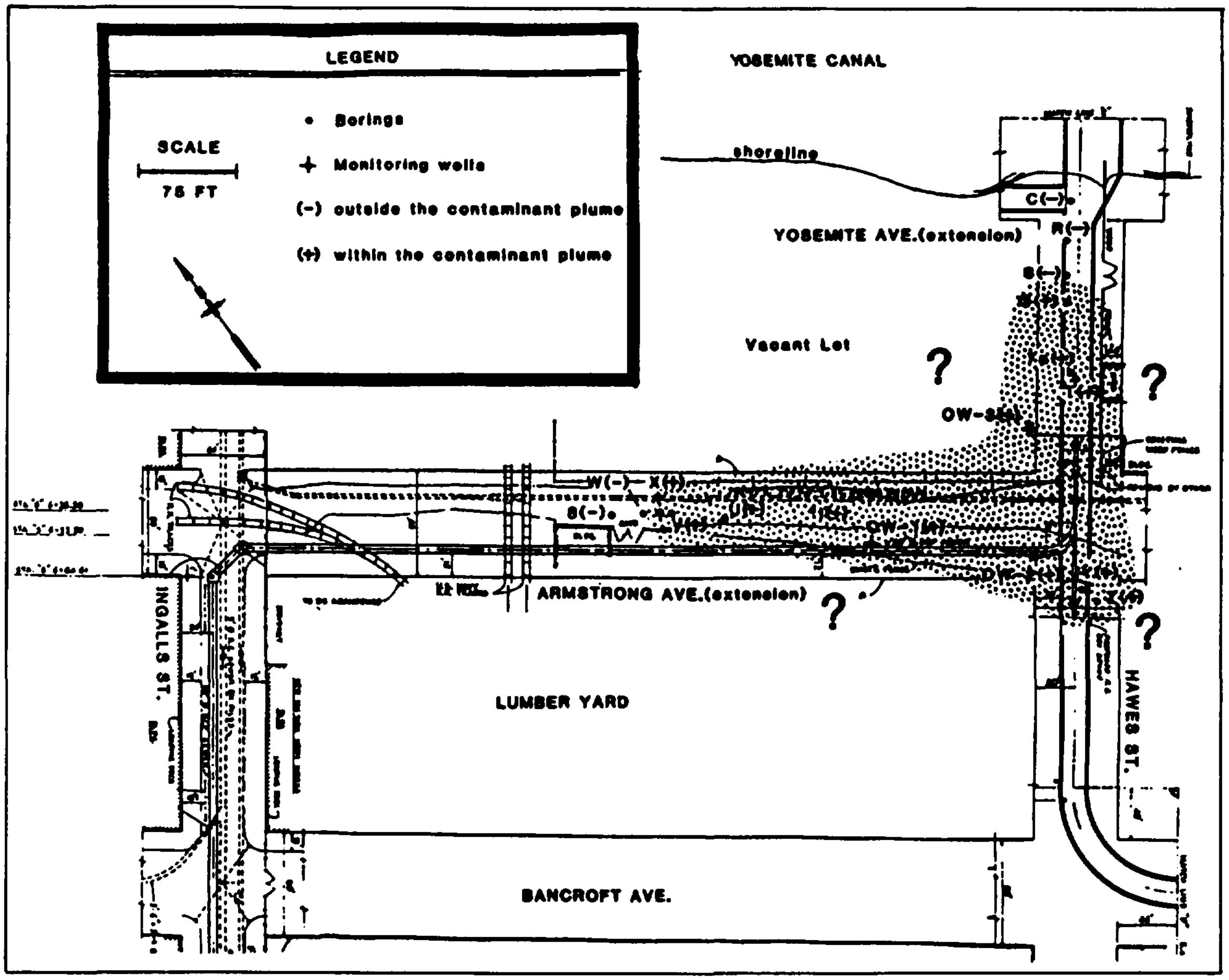
D ○ Inferred location and designation

/////// Buckeye Properties

Reference: ERM-West, 1987
City of San Francisco
Soil Investigation Report

Source: Larry Matthews Industrial Properties, Inc.

Christopher M. French, R.G. ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT	**BORG LOCATION MAP** **ERM-WEST**	Amen, Keith & Berg		
		Job Number	Date	Plate
		9011	11/89	14



0 200 Feet

Reference: "Estimated extent of subsurface contaminant plume, Armstrong and Hawes" ERM-West, 1987

ERM-WEST CONTAMINANT DISTRIBUTION MAP

Amen, Keith & Berg

Job Number	Date	Plate
9011	11/89	15

Christopher M. French, R.G.

ENVIRONMENTAL INVESTIGATION, REMEDIATION, AND RISK ASSESSMENT

Attachment B
Tables

Table 1. Aerial Photography Compilation, 1939 - 1957, Amen, Keith & Berg, San Francisco, California

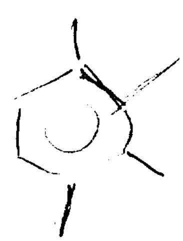
Date	Photograph Number	Source
1939 (?)	AV-248-07-04	Pacific Aerial Surveys
1944 (?)	unknown	Alameda NAS
10/11/43	DDB-2B-124	National Archives
03/30/45	photomosaic - none	U.C. Berkeley, Bancroft
07/25/46	2-87 GS-CP	National Archives
1940s (?)	Neg. #11318/oblique	G. Moulin Studios
May, 1947	Neg. #11520/oblique	G. Moulin Studios
May, 1947	Neg. #11525/oblique	G. Moulin Studios
07/28/48	AV-17-12-15, -16	Pacific Aerial Surveys
01/30/51	4 VV 5RTM 2128 5SRG	National Archives
05/28/52	44 VV17PL R 52-13 363TRG	National Archives
02/10/53	VV 302TRS M 553 TAC 10FEB53 302/60 S-24	National Archives
05/05/55	AV 170 08 14	Pacific Aerial Surveys
09-12-57	Negative 12117-2	G. Moulin Studios

Table 2. Groundwater Analytical Results for Boring 7A, ERM-West (1987), Yosemite Fitch Outfall Consolidation Project, Amen, Keith & Berg, San Francisco, California

Constituent	Concentration (ug/l)	ppb EPA ug/l	MCL DHS ug/l
Base-Neutral Compounds (EPA Method 625)			
Acenaphthylene	190	—	
Anthracene	1,600	—	
Benzo (a) Pyrene	66	—	
Bis (2-ethylhexyl) phthalate	96	NL	
Chrysene	360	—	
Fluoranthene	1,300		
Fluorene	380	—	
Naphthalene	2,700	—	
Phenanthrene	820	—	
Pyrene	1,000	—	
Halogenated Hydrocarbons (EPA Method 601)			
1,1-dichloroethylene	<0.5 - 200	7	6
1,2-dichloroethylene	170	NL	
Aromatic Hydrocarbons (EPA Method 602)			
Benzene	800	5	1
Toluene	140	2,000	100
Ethylbenzene	1,000	700	680
Xylene	1,200	10,000	1,750

+ PCB's

ppb = $\mu g/l$



$\frac{1 mg}{l} = \frac{1000 \mu g}{l}$

Table 3. Soil and Waste Oil Analytical Results for Borings 7A and 8, ERM-West (1987), Yosemite Fitch Outfall Consolidation Project, Amen, Keith & Berg, San Francisco, California

Soil Organic Constituent	**Boring 7A**	**Boring 8**
Total Pet. Hydrocarbons	680	<0.5- 7
Benzene	NR(?)	0.33-0.66
Toluene	NR(?)	<0.5-870
Ethylbenzene	NR(?)	<0.5-140
Xylene	NR(?)	<0.5- 97

Waste Oil Constituent	**Boring 7A**	**Boring 8**
Creosote	<10	<10
Pentachlorophenol	<10	<10
Inorganic Constituents		
Beryllium	<0.2	0.3
Cadmium	12	0.2
Chromium (Total?)	43	35
Copper	440	64
Lead	230	13
Nickel	140	28
Silver	0.80	0.40
Zinc	7,400	35
Antimony	1.4	<0.2
Arsenic	24	5
Selenium	<0.1	<0.1
Thallium	<0.2	0.03
Mercury	0.023	0.039
Cyanide	<0.2	<0.2

Note: Analytical data expressed in milligrams per kilogram (mg/kg), or parts per million (ppm)

Attachment C
Briscoe (1979) and
Legal Statutes

LEGAL PROBLEMS OF TIDAL MARSHES

JOHN BRISCOE
Deputy Attorney General, Room 6000 State Office Building, San Francisco, CA 94102*

Three legal problems that afflict tidal marshes are (1) the rights and liabilities of persons seeking to alter the natural condition of a marsh, (2) boundaries of ownership interests within a marsh, and (3) boundaries of the jurisdictions of government agencies having power to regulate filling, dredging or other activities within the marsh. 1) The legal theories of public nuisance and public trust are means of preventing or remedying demonstrable injury to a tidal marsh. Several cases demonstrate the law's need in this context for an understanding of the processes of the tidal marsh. 2) To determine ownership interests within a tidal marsh it is often critical to locate the line of mean high water (MHW) in either its present or some prior position. 3) Similarly, the geographical extent of the authority of government bureaus to control filling, dredging, or other human activities within tidal marshes is often a function of tidal datums. For this purpose the lines of MHW and of mean higher water (MHHW) (in either the present or some past location of the line) are most frequently employed.

Tidal marshes have bred legal problems as abundantly as their brackish reaches can breed mosquitoes in summer. While an in-depth treatment of these problems would require volumes, the purpose of this chapter is to give the scientist a brief glimpse of the law's need for his knowledge of marshes.

Two of the three subjects discussed are boundaries: boundaries of ownership interests in tidal marshes, and jurisdictional boundaries of agencies that regulate the diking, filling, dredging or other altering of marshes. The third subject, which is treated first, is the vast area of legal questions that arise from direct human threats to the viability of a marsh or to its dependent life systems.

THE DEGRADING OR DESTROYING OF MARSHES BY MAN

Human threats to marshes center on the draining or filling or marshes, or the polluting of the waters of a marsh. The legal problems chiefly entail questions of the adequacy of environmental documents prepared for a proposed project, and whether alleged threats to a marsh are real or imagined.[1] Although even a superficial survey of these questions is beyond the scope of this chapter, it shows that even before the gauntlet of modern laws was thrown down to these threats (Table 1), the law often saw a remedy for demonstrable injury to the environment. An ancient doctrine of "public nuisance," for one, afforded such a remedy. Three early California cases illustrate this doctrine.

In one landmark decision the State sought to prohibit the dumping of hydraulic-mining

*The views expressed herein are not necessarily those of the Attorney General or of other bureaus of the State.

[1] Applications for projects requiring federal, state or local approval now must usually be accompanied by assessments of the projects' environmental impacts. See National Environmental Policy Act of 1969, 42 U.S.C. § § 4331-4347 and Zabel vs. Tabb, 430 F.2d 199 (1970), discussed below, and the California Environmental Quality Act, California Pub. Resources Code § § 21000-21176, and Friends of Mammoth vs. Board of Sup'rs of Mono County, 8 Cal.3d 247 (1972).

TABLE 1. MAJOR LEGAL DEVELOPMENTS IN THE ENVIRONMENTAL HISTORY OF SAN FRANCISCO BAY

Date	Event	Impact
1851	San Francisco Beach and Water Lot Act	First State statute authorizing the sale of tidelands to private parties. (Subsequent sales statutes pertaining to S.F. Bay were enacted in 1868 and 1870, among other dates.)
1879	New State Constitution adopted, effective 1 January 1880	Separate articles prohibited (1) private landowners from denying the public right of way to navigable waters whenever required for a public purpose, and (2) the sale to private parties of any tidelands within 2 miles of an incorporated city or town.
1913	California Supreme Ct. Decision in *People* vs. *California Fish Co.* 166 Calif. Reports 576.	Held that (1) tidelands sold by State to private parties remain subject to a "public trust" easement, and (2) sales of lands lying "below low tide" are wholly invalid. (Authorizing statute reviewed by Court excluded from its operations lands within five miles of San Francisco.)
1965	Creation by California legislature of S.F. Bay Conservation and Development Commission.	Temporary agency to formulate comprehensive plan for Bay; given life of four years.
1968	State - Leslie Salt Co. land agreement	First Agreement with major San Francisco Bay landowners recognizing State titles to tide and submerged lands within boundaries of lands sold by State as "swamp-and-overflowed lands." Agreement reached after 20 years of negotiations.
1969	McAteer-Petris Act	San Francisco Bay Conservation and Development Commission made a permanent agency.
	"Westbay" lawsuit filed in San Mateo County	State challenged landowners' claims of clear title to 188 acres of tide and submerged lands in S.F. Bay.
1971	Calif. Supreme Ct. Decision in *Marks* vs. *Whitney*, 6 Cal. Reports 3d 251	Reaffirmed principles of *People* vs. *California Fish Co.* Held that public trust purposes include keeping tidelands in a natural condition.
1972	Corps of Engineers amends regulations to assert regulatory authority to "former" line of mean higher-high water (i.e., prior to changes such as diking.)	Expanded jurisdiction, if valid, would encompass many salt ponds and other reclaimed marshlands.
	Westbay lawsuit expanded	Private landowners place in issue title to additional 10,000 acres of tide and submerged lands presently under S.F. Bay waters. Perhaps largest, most complex land litigation in history.
1977	Westbay case settled	State's absolute title to 75% of disputed land recognized. Remaining 25% adjudicated to be held by landowner subject to the public trust.
1978	*Leslie Salt Co.* vs. *Froehlke*	Court of Appeals for the Ninth Circuit invalidates Corps of Engineers' regulations extending jurisdiction to former line of mean higher-high water, as to Rivers and Harbors Act jurisdiction only. Regulations respecting Corps authority under the Federal Water Pollution Control Act upheld.
1979 (?)	*Murphy* vs. *City of Berkeley*	California Supreme Court has taken case from Court of Appeal, which held that tideland sales in Berkeley pursuant to 1879 Act did not lift the public trust. Scope of Supreme Court's decision cannot be predicted.

debris into the North Fork of the American River. With respect to non-tidal streams, California owns the beds only of such streams that are "navigable," and the State Supreme Court wrote that the North Fork was an unnavigable stream. But because the debris was carried from the point of dumping down to the confluence with the Sacramento River, where it settled and impaired the navigability of the Sacramento, the dumping was ordered enjoined. Two statements of the Court bear consideration:

> To make use of the banks of a river for dumping places, from which to cast into the river annually six hundred thousand cubic yards of mining debris, consisting of boulders, sand, earth, and waste materials, to be carried by the velocity of the stream down its course and into and along a navigable river, is an encroachment upon the soil of the latter, and an unauthorized invasion of the rights of the public to its navigation; and when such acts not only impair the navigation of a river, but at the same time affect the rights of an entire community or neighborhood, or any considerable number of persons, to the free use and enjoyment of their property, they constitute, however long continued, a public nuisance . . . .
>
> Accompanying the ownership of *every species of property* is a corresponding duty to use it as that it shall not abuse the rights of other recognized owners. . . .
>
> Upon that underlying principle, neither State nor Federal leglislatures could, by silent acquiescence, or by attempted legislation, take private property for a private use, nor divest the people of the State of their rights in the navigable waters of the State for the use of private business, *however extensive or long continued.* (*People* vs. *Gold Run D. & M. Co.*, 66 Cal. 138, 147, 151 [1884].) (Emphasis added.)

In a later case the State sought to prohibit the damming of a small salt-marsh slough tributary to the Salt and Eel Rivers. Again the State Supreme Court held that ownership of the beds of the sloughs affected by the dam was immaterial. If damming diminished the navigability of the trunk stream, it was enjoinable. And "[t]he fact that these sloughs carry tide-waters, which ebb and flow, presents no different case from one where the tributaries so dammed flowed fresh water." The Court further held that even government authorization to reclaim the marshes gave their owner no right to do anything harmful to the navigability of the state's streams. "The Swamp and Overflowed Land Act does not purport to give the owner that right, even conceding such a power in the state, and the right of the public in the use of a stream, as a public highway, is paramount to any right which the owner of the land has to reclaim his land from over flow." (*People* vs. *Russ*, 132 Cal. 102, 105 [1901]).

The dumping of a sawmill's waste into the Truckee River was the object of another early lawsuit brought by the State. Dumping was alleged to be harmful to fish that spawned in and passed through the waters of the river. The State Supreme Court held that fish are "the most important constituent of that species of property commonly designated as wild game, the general right and ownership of which is in the people of the state. . . ." That being so, the ownership of the bed of the Truckee River was immaterial, the court held, and the People were entitled to an injunction stopping the pollution (*People* vs. *Truckee Lumber Co.*, 166 Cal. 397, 399, 402 [1897]).

There is evidence (Teal 1962; Johnston 1956 [San Francisco Bay]; Valiela and Vince 1976; Haedrick and Hall 1976; Sims 1970) that marshes serve as breeding grounds for various species of fish and that marsh-plant detritus is a link in the food chain of certain fish species.[2] Additionally there is evidence (Mitchell 1869; Pillsbury 1939; Marmer 1926) that salt marshes, as reservoirs of the waters of tidal floods, keep the main estuary channels scoured and

[2] There are too some contrary indications withrespect to the role of marsh-plant detritus as a link in the food chain. (Haines 1977).

navigable.[3] These cases indicate that even before the enactment of modern environmental protection laws, there has been an adequate understanding of the tidal marsh and its processes to provide a foundation for the legal means to prevent the degradation or outright destruction of the marsh.

This proposition seems all the more valid when these cases are read together with cases that expound the "public trust" doctrine. This doctrine holds that tidelands (in general, lands subject to tidal action and lying below the elevation of mean high water [MHW] as well as non-tidal lands below navigable waters, are held by the State subject to a public trust for purposes (among others) of navigation and fisheries (*Marks* vs. *Whitney*, 6 Cal. 3d 251 [1971].[4] And significantly, while not all tidal marshes are "tidelands" within this definition, the public-trust doctrine in California burdens property *abutting* tidelands and navigable waters, as well as the tidelands and navigable waters themselves, "with a servitude commensurate with" the public trust power itself (*Colberg, Inc.* vs. *State of California ex rel. Dept. Pub. Wks.*, 67 Cal. 2d 408, 420 [1967]; *Miramar Co.* vs. *Santa Barbara*, 23 Cal. 2d 170 [1943]). In other words, the public-trust power, while arising from the State's ownership of "tidelands," nevertheless may extend shoreward of the tideland boundary when necessary to effect the purposes of the trust. The significance of this principle is that action taken pursuant to this power requires no payment of compensation to the landowner, since the affected property is already "burdened" with that power (i.e., the landowner bears the risk that the power may be exercised). The *Just* case, discussed below, explores the area of compensation more fully.

Three contemporary cases which have had a profound impact on this subject of man's degradation of marshes should be mentioned briefly. Describing the doctrine of nuisance as "the oldest form of land use control," the California Court of Appeal in 1974 held valid California's coastal initiative (passed by the voters in 1972 and popularly known as "Proposition 20"), in part in reliance on that doctrine (*CEEED* vs. *California Coastal Zone Conservation Com.*, 43 Cal.App.3d 306, 318 [1974]).[5]

[3] "Mitchell's Rule" is: "A river having a bar at its mouth will be injured as a pathway for navigation if the tidal influx is reduced by encroachments upon its basins." Grove Karl Gilbert (1917: 102-103) described shoaling that had occurred in Mare Island Strait since the advent of marshland reclamation and hydraulic mining. ". . . I am not aware that the influence of reclamation has been mentioned in this connection, but there need be no question that the impairment of the channel has been caused in part by the weakening of the tidal currents," which had been in turn caused by reclamation of the adjoining marshlands.

[4] The Marks case held specifically: "Public trust easements are traditionally defined in terms of navigation, commerce and fisheries. They have been held to include the right to fish, hunt, bathe, swim, to use for boating and general recreation purposes the navigable waters of the state, and to use the bottom of the navigable waters for anchoring, standing, or other purposes. The public has the same right in and to [even privately owned] tidelands.

"The public uses to which tidelands are subject are sufficiently flexible to encompass changing public needs. In administering the trust the state is not burdened with an outmoded classification favoring one mode of utilization over another. There is a growing public recognition that one of the most important public uses of the tidelands—a use encompassed within the tidelands trust—is the preservation of those lands in their natural state, so that they may serve as ecological units for scientific study, as open space, and as environments which provide food and habitat for birds and marine life, and which favorably affect the scenery and climate of the area. It is not necessary to here define precisely all the public uses which encumber tidelands." 6 Cal.3d at 259-260 (Citations omitted). As discussed in the section concerning ownership, below, it must be considered in each case whether the tract of marshland in question is in fact "tideland" within the legal definition, or falls within some other legal classification of land.

[5] "The law of nuisance, called the oldest form of land use control, evolved from the ancient maxim 'sic utere tuo ut alienum non laedes'—one must so use his rights as not to infringe on the rights of others. At common law a public nuisance was defined as an act or omission which obstructs or causes inconvenience or damage to the public in the exercise of rights common to all "Her Majesty's subjects." Subject to constitutional barriers against unreasonable or arbitrary action, the Legislature may declare that a specified condition or activity constitutes a public nuisance. The power of the state to declare acts injurious to the state's natural resources to constitute a public nuisance has long been recognized in this state. Contemporary environmental legislation represents an exercise by government of this traditional power to regulate activities in the nature of nuisances. . . ."(Footnotes and citations omitted). 43 Cal.App.3d at 318.

A Federal appeals court in 1970 held that the U.S. Army Corps of Engineers, in reviewing applications to fill or dredge navigable waters, may consider environmental consequences of the proposal and is not confined to considering only the effect of the project on the Corps' traditional ward, navigation (*Zabel* vs. *Tabb*, 430 F.1d 199 [5th Cir. 1970]).

A 1972 Wisconsin Supreme Court decision, *Just* vs. *Marinette County*, has similarly been considered a landmark case in environmental law, particularly with respect to marshlands. A county ordinance, enacted pursuant to State law, prohibited the filling, draining or dredging of "wetlands" without a permit. The legal question was whether these restrictions amounted to a "constructive"(i.e. virtual) taking of property for a public use, which under the constitution would require the payment of just compensation to the owners. States have the power of eminent domain, which authorizes the taking of private property for public purposes upon the payment of just compensation, and they also have the police power, which is the basis for our criminal and health laws. When laws enacted under the police power restrict the uses to which land can be put, there is often the charge that the restrictions amount to a "taking" that requires compensation. Just when a land-use restriction becomes a "taking" is an elusive question. It has been the subject of many court decisions and journal articles, no one of which has formulated a criterion that is satisfactory in all cases. The extent of the restriction, and the loss of value it causes, are frequently examined, but are not necessarily determinative. In *Just* vs. *Marinette County*, the court analyzed the issue according to an old, and not always adequate, formulation: whether the restriction is intended to secure a benefit for the public it does not presently enjoy, or whether it is intended to prevent an injury to the public. Since this ordinance was designed merely to preserve the *status quo* (i.e. to prevent further degradation of water quality and wildlife habitat), it was held a valid exercise of the police power, and not a taking.[6] Although hailed as an important natural-resources decision, *Just* nonetheless did not treat, nor did the controversy require it to treat, the question of proper remedies for past injury to wetlands.

OWNERSHIP

Ownership, the second area of legal problems affecting tidal marshes, may be as intricate as a marsh's network of sloughs and rivulets. Although some marsh lands were granted to individuals by Spain and Mexico when those countries were sovereign in California, to be recognized after the United States' annexation of California, these grants were required to be confirmed by a Board of Land Commissioners especially created to hear the claims of persons to such grants.

With the exception of this unique category of land, there are three legal classifications (or "characters") of land found within tidal marshes: "swamp-and-overflowed lands," "tidelands," and "submerged lands." (These are court-defined legal expressions having no intrinsic engineering or scientific meaning). With few exceptions, submerged lands, lands lying waterward of the "ordinary low water mark," were never made available for private purchase and purported purchases of these lands are void. [Editor's note: See Atwater et al. 1979, Table 1 for definition of tide-datums and heights.] But statutes authorizing the sale of both tidelands and swamp-and-overflowed lands

[6] The Just Court reasoned: "We are not unmindful of the warning in *Pennsylvania Coal Co.* vs. *Mahon* (1922) U.S. 393, 416, 43 S.Ct. 158, 160, 67 L.Ed. 322:

'. . .We are in danger of forgetting that a strong desire to improve the public condition is not enough to warrant achieving the desire by a shorter cut than the constitutional way of paying for the change.' This observation refers to the improvement of the public condition, the securing of a benefit not presently enjoyed and to which the public is not entitled. The shoreland zoning ordinance preserves nature, the environment, and natural resources as they were created and to which the people have a present right. The ordinance does not create or improve the public condition but only preserves nature from the despoilage and harm resulting from the unrestricted activities of humans.' 201 N.W. 2d at 771.

were enacted by the California legislature in 1850. And while the same laws provided for the sale to private parties of both these characters of land, the distinctions between the two types of land are critical. For as to swamp-and-overflowed lands:

> "The lands which passed to the state by grant under the Swamp Land Act were thereafter subject to absolute alienation by the state, free of any public trust for navigation. (*Newcomb* vs. *City of Newport Beach, supra,* 7 Cal. 2d 393, 400.)

Whereas the purchaser of tidelands

> . . . owns the soil, subject to the easement of the public for the public uses of navigation and commerce, and to the right of the state, as administrator and controller of these public uses and the public trust therefor, to enter upon and possess the same for the preservation and advancement of the public uses, and to make such changes and improvements as may be deemed advisable for those purposes. (*People* vs. *California Fish Co., supra* at 598).

But determining where a tract of swamp-and-overflowed land (or "swamp land" for short) ends and the tideland begins may not be a simple matter. The California Supreme Court has observed:

> These swamp and overflowed lands embraced large areas in the interior of the state, situated in the San Joaquin and Sacramento valleys, and extending down to tide water in the bay of San Francisco. There the tide flats in many places merged into them imperceptibly, making it difficult to distinguish between them. (*People* vs. *California Fish Co.,* 166 Cal. 576, 591 [1913]).

To demonstrate why this difficulty exists it is necessary to examine the roots of title to these two characters of land (Fig. 1). Tidelands and other lands beneath navigable waters within California became the property of the State as an incident of sovereignty when California became a state on 9 September 1850.[7] (These lands were held by the State in the public trust mentioned above). Excepting the grants made previously by the Spanish and Mexican governments, all other land within the State was then the property of the Federal government, including "swamp-and-overflowed lands," which Congress granted to California 19 days later.[8] With certain possible exceptions, the boundary between the tideland and the upland (swamp lands being a species of upland) is a line the law calls the "ordinary high water mark."[9]

But like "tidelands" and "ordinary low water mark," "ordinary high water mark" is a legal expression that has no intrinsic meaning to an engineer or surveyor. Courts have given it meaning as to certain types of topography. It has been held for example that the ordinary high water mark along a non-tidal navigable river is the line at which vegetation stops (see *Oklahoma* vs. *Texas,* 260 U.S. 606, 632 [1922]; Skelton, Boundaries and Adjacent Properties 310-11 [1938]).

After much confused law on the meaning of the term for purposes of *tidal* water boundaries,

[7] *Martin* vs. *Waddell* 41 U.S. (16 Pet.) 367, 410 (1842); *Shively* vs. *Bowlby,* 152 U.S. 1, 15, 26 (1894); *Weber* vs. *Harbor* Commissioners, 85 U.S. (18 Wall) 57, 65-66 (1873); *People* vs. *California Fish Co.,* 166 Cal. 576, 584 (1913); *Marks* vs. *Whitney,* 6 Cal.3d 251, 258 (1971).

[8] 9 Stats. 519 (28 September 1850), 43 U.S.C. § 981 et seq.

[9] *Barney* vs. *Keokuk,* 94 U.S. 324, 336-38 (1876); *Borax, Ltd.* vs. *Los Angeles,* 296 U.S. 10, 22 (1935); *Wright* vs. *Seymour,* 69 Cal. 122, 126 (1886); *Long Beach Co.* vs. *Richardson,* 70 Cal. 206(1886); *Oakland* vs. *Oakland Water Front Co.,* 118 Cal. 160, 183 (1897); *Pacific Whaling Co.* vs. *Packers' Association,* 138 Cal. 632, 635, 636 (1903); *People* vs. *California Fish Co., supra,* 166 Cal. 576, 584 (1913); Civil Code § 670. See also *Strand Improvement Co.* vs. *Long Beach,* 173 Cal. 765, 770 (1916); *Miller & Lux* vs. *Secara,* 193 Cal. 755, 671, 762 (1924).

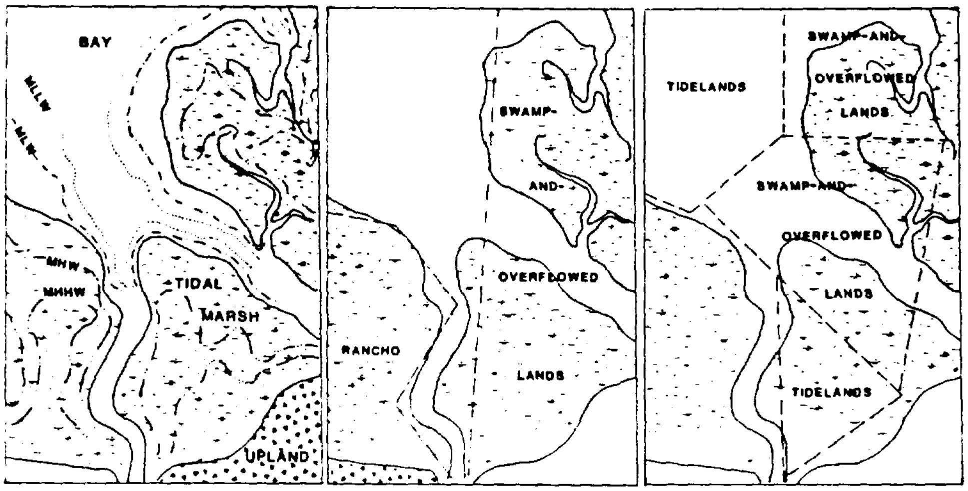


Fig. 1. Projection of tidal datums (left) and property lines (center and right) onto a hypothetical tidal marsh. Center diagram shows lines surveyed by the U. S. Government after the annexation of California in 1848. The ranch was granted to a private party by either Spain or Mexico before annexation, confirmed by the American Board of Land Commissioners after annexation, and subsequently surveyed by the Federal government. The government was also required to identify the "swamp-and-overflowed lands" that it granted to California on 28 September 1950, and often did so by survey. Surveyors were not always careful to locate the true "ordinary high water mark," or as it has been defined by some courts, the mean high water line. Nonetheless the true boundary remains the ordinary high water mark, no matter how erroneous the survey, which was run chiefly to compute acreages. California laws enacted in 1850 authorized the sale to private purchasers of tidelands and swamp-and-overflowed lands. These sales were made according to surveys that frequently did not correspond to the Federal surveys, much less the actual topography. The right-hand figure depicts a typical pattern of surveys done for these State sales. This lack of congruence between the true physical conditions and the designations of title documents creates many title disputes today.

the U.S. Supreme Court held in 1935 that the "ordinary high water mark" separating privately owned uplands (which had been sold by the Federal government) from the tidelands of San Pedro Harbor was the line of mean high water (*Borax Ltd.* vs. *Los Angeles,* 296 U. S. 10 [1935]).[10] For the first time surveyors and engineers had authoritative guidance how to locate the ordinary high water mark, since the mean high water line is the intersection with the shore of the plane of a published, precisely determined tidal datum (Shalowitz 1964:581). It is not always, however, an easy task to determine precise elevations in a marsh:

> Obviously, it would be an extremely difficult task to identify the actual high-water line in marsh areas. The marsh may be in various states of growth, from its early beginnings, when it is mostly a submerged stage, to its latest development, when it is close to or slightly above the plane of high water. Between these two extreme

[10] See, e.g., *Teschemacher* vs. *Thompson,* 18 Cal. 11, 21 (1861); *Otey* vs. *Carmel Sanitary District,* 219 Cal. 310, 313 (1933). These cases may be read as asserting that the "ordinary-high-water-mark" is not equivalent to the line of mean high water, that is, the mean of all high waters, but rather to a line of the mean of "neap" high waters. The error of this position from a legal standpoint, and the courts' fanciful misconceptions of neap tides, have been thoroughly explored (Maloney and Ausness 1975).

conditions, marsh areas may be entirely submerged at low water, may be exposed at low water and submerged at high water, or may be partially exposed at high water. . . (Shalowitz 1964:176-177).[11]

Thus locating the MHW line in a natural marsh is not always a simple matter. Moreover, artificial changes in the condition of a marsh may further complicate the determination of the legal character of the land (see for example Atwater et al. 1979). For when a marsh has been filled, diked, or otherwise altered by man, the relevant legal inquiry *may* shift from the present land elevations to the elevations of the land when it was last in a natural condition.[12] When the inquiry does so shift, an expert must determine first the existence of any changes that have occurred in the marsh, such as diking, dredging or filling, or more subtle changes such as eolian deflation, subsidence, or accretion to or erosion of the marsh edge. The expert must then determine the cause of these changes. Desiccation or ground-water withdrawal may be causes of subsidence, and alteration of the natural sedimentation or wave patterns may be causes of a prograding or retrograding marsh edge. The next task is to determine (as well as possible) the conditions that existed before the change, specifically the marsh-surface elevations.

Of interest to the marsh botanist are the attempts that have been made to locate the MHW line in a natural marsh by determining the distribution of vascular plants with respect to tidal datums (Maloney and Ausness 1974). A New York court has rejected such an approach as inconsistent with that state's law of coastal boundaries.[13]

Of course, locating the ordinary high water mark is not the only task that must be done. Historical research and legal analysis of documents in the chain of title must be completed before the true state of ownership can be determined.

JURISDICTION OF REGULATORY AGENCIES

As with questions of ownership, tidal datums largely dictate the authority and responsibility of agencies having jurisdiction over the uses of tidal marshes. The U. S. Army Corps of Engineers has authority to regulate the diking, dredging or filling of marshes. The Corps has two statutory

[11] Further evidence of the problem of surveying a mean-high-tide line in tracts of swamp is contained in several technical documents:

(a) Field Memorandum No. 1, United States Coast and Geodetic Survey (1938): "In marsh, mangrove, and cypress or similar swamp areas, the mean high water line is generally obscured by the vegetation and will not ordinarily be located."

(b) See also U.S. Coast Survey (1865), App. 22; p. 205; 1891, App. 16; p. 609, 633-34.

(c) The U.S. Coast and Geodetic Survey (1928) instructed:

"43. The high-water line.–The high-water line shall be drawn with sufficient strength to make it clearly distinguishable. The identification of the high-water line on marsh is usually difficult. The outer edge of a typical marsh is vertical and is sometimes covered at high-water, but for use on navigational charts its vertical edge should be indicated as the high-water line. The inner edge of the marsh (the limit of submergence at high water) when clearly defined may be drawn by a line distinctly lighter than the high-water line. . . ."

(d) The U. S. Coast and Geodetic Survey (1963:42) explains: "The mean high-water line in marsh, mangrove, cypress, or similar swamp areas is generally obscured by vegetation and will not ordinarily be located on topographic surveys. In such areas, the outer edge of vegetation visible above Mean High Water, usually represented by a fine line on the topographic survey, presents a fairly definite shoreline. . . ."

[12] *Carpenter* vs. *City of Santa Monica*, 63 Cal.App.2d 772, 787-788 (1944); *City of Los Angeles* vs. *Anderson*, 206 Cal. 662, 667 (1929) Civil Code § 1014; *O'Neill* vs. *State Highway Dept.*, 235 A.2d 1, 10 (N.J. 1967). The federal rule appears to ignore at least some artificial changes *County of St. Clair* vs. *Lovingston*, 90 U.S. (23 Wall.) 46, 68 (1874), but it may be rare that the Federal rule applies in California. *Or. ex rel. State Land Bd.* vs. *Corvallis Sand & G.*, 97 S.Ct. 482 (1977).

[13] *Dolphin Lane Assoc.* vs. *Town of Southampton*, 372 N.Y.S. 2d 52, 53-54 (1977).

bases for this authority. Sections 9 and 10 of the Rivers and Harbors Act of 1899[14] essentially prohibit the building of any "dam," "dike," "obstruction," or "other structures" within the "navigable waters of the United States" without the approval of the Corps. Similarly section 404 of the Federal Water Pollution Control Act as amended in October 1972 (FWPCA)[15] charges the Corps with regulating the discharge of dredged or fill material into "navigable waters."

The meanings of the term "navigable waters of the United States" and the simpler term "navigable waters," then, are critical to the jurisdiction of the Corps. Originally separate regulations defining these terms were adopted by the Corps for the Rivers and Harbors Act and for the FWPCA.[16] These regulations were revised and integrated effective 19 July 1977 and codified in Title 33, Code of Federal Regulations, sections 320 *et seq.*[17] There are two definitions for purposes of the Rivers and Harbors Act. If lands are used, or have been used, or may be susceptible to use to transport interstate or foreign commerce, they are "navigable waters of the United States." Secondly the term includes all lands subject to the ebb and flow of the tide shoreward on the Pacific Coast to the line of mean higher high water (MHHW).[18] Significantly, "an area will remain 'navigable in law,' even though no longer covered with water, whenever a change in condition has occurred suddenly, or was caused by artificial forces intended to produce that change."[19] Thus in diked or filled marshes, one must determine the "former" line of MHHW.

For purposes of the FWPCA, the regulations define "navigable waters" much more broadly than they define "navigable waters of the United States" for the Rivers and Harbors Act. The FWPCA regulation subsumes "navigable waters of the United States" since it includes both the "susceptibility" and the MHHW definitions, but it additionally includes all marshes, swamps and "similar areas," among other features.[20]

An additional regulation giving a much more detailed definition of the term "navigable waters of the United States" is set forth in section 329.1 *et seq.* of Title 33 of the Code of Federal Regulations. This section, which gives numerous examples intended to illustrate the term, applies to jurisdiction asserted under both the Rivers and Harbors Act and the FWPCA. It also includes the interpretation that lands formerly subject to the tides but which have been excluded from tidal action by dikes or other man-made works are still "navigable waters of the United States."[21]

The complexities of determining, for example, whether the Corps has jurisdiction under the Rivers and Harbors Act over a tract of reclaimed marsh are apparent. If the marsh cannot be said to have been "susceptible of use for commercial navigation," then it must be determined whether in its natural state it lay above or below the MHHW elevation. Determining elevations within a natural marsh may pose problems enough (see also National Ocean Survey 1975). But, as discussed above, when it has been walled off from the tides many factors can further complicate determining

[14] 33 U.S.C. § 401 *et seq.*

[15] 33 U.S.C. § 1251 *et seq.*

[16] These regulations, now superseded, were codified at 33 C.F.R. § 209.120(d) (1), together with 33 C.F.R. § 209.120(d)(1), together with 33 C.F.R. § 209.260 *et seq.* (regulations for the Rivers and Harbors Act), and 33 C.F.R. § 209.120(d)(2) (regulations for the FWPCA).

[17] See 42 Fed. Reg. 37122 *et seq.* (July 19, 1977).

[18] 33 C.F.R. § § 321.2 and 322.2.

[19] 33 C.F.R. § 329.13.

[20] 33 C.F.R. § 323.2 (b), and (c).

[21] 33 C.F.R. § 329.13.

former elevations of the marsh. There is evidence that when drained and allowed to dry, the marsh soil compacts so that its elevation is lowered. When reflooded it may not "sponge" back or expand, its elevation remaining the same (excluding future deposition).[22] The problem would be compounded by any filling or excavating done after the diking.

The validity of these regulations is the subject of a decision that was handed down 11 May 1978, by the United States Court of Appeals for the Ninth Circuit.[23] In that decision the Court wrote:

> We hold that in tidal areas, navigable waters of the United States, as used in the Rivers and Harbors Act, extend to all places covered by the ebb and flow of the tide to the mean high water (MHW) mark in its unobstructed, natural state. Accordingly, we reverse the district court's decision insofar as it found that the Corps's jurisdiction under the Rivers and Harbors Act includes all areas within the former line of MHHW in its unobstructed, natural state. . . .
>
> We therefore hold that the Corps's jurisdiction under the FWPCA extends at least to waters which are no longer subject to tidal inundation because of Leslie's dikes without regard to the location of historic tidal water lines in their unobstructed, natural state. We express no opinion on the outer limits to which the Corps's jurisdiction under the FWPCA might extend. (578 F.2d at 753, 756.)

As with the Corps, two California state agencies charged with regulating coastal development also have their jurisdiction defined by reference to tidal datum planes. The older of the two agencies, the San Francisco Bay Conservation and Development Commission (BCDC), is charged with planning for and regulating development as well as conservation of San Francisco Bay. The commission's jurisdiction includes

> (a) San Francisco Bay, being all areas that are subject to tidal action from the south end of the bay to the Golden Gate (Point Bonita-Point Lobos) and to the Sacramento River line (a line between Stake Point and Simmons Point, extended northeasterly to the mouth of Marshall Cut), including all sloughs, and specifically, the marshlands lying between mean high tide and five feet above mean sea level; tidelands (land lying between mean high tide and mean low tide); and submerged lands (land lying below low tide).
>
> (c) Salt ponds consisting of all areas which have been diked off from the bay and have been used during the three years immediately preceding the effective data of the amendment of this section during the 1969 Regular Session of the Legislature for the solar evaporation of bay water in the course of salt production. (Gov. Code section 66610).

The regional and statewide coastal commissions created by passage of Proposition 20 in 1972 were supplanted last year when the legislature passed the California Coastal Act, which created a new statewide California Coastal Commission and six regional commissions. The authority and duties of these bodies are similar to that of BCDC, but their jurisdictions extend to the areas of California's coastline other than San Francisco Bay; BCDC's existence was not altered by passage of the Coastal Act. The jurisdiction of these agencies is the "coastal zone," which is also defined in section 30103 of the Public Resources Code by reference to the MHW line.

[22] Deposition of Claire Lopez, Chief Engineer for the Leslie Salt Co. from 1938 to 1964, taken April 23-26, 1973, in *Sierra Club et al.* vs. *Leslie Salt Co., et al.*, United States District Court for the Northern District of California, No. 72-561, and *State of California* vs. *County of San Mateo et al.*, San Mateo Superior Court No. 144257, pp. 112, 278-280.

[23] *Leslie Salt Co.* vs. *Froelhke*, 578 F2d 742 (9th Cir. 1978).

AN EXAMPLE OF HISTORICAL EVIDENCE: UPPER NEWPORT BAY, CALIFORNIA

Given the foregoing, it is clear that the engineer or scientist must frequently resort to whatever historical evidence exists respecting the character of a marsh. Even when such historical evidence exists, however, it may generate more confusion than it disperses. Although examples within San Francisco Bay are not lacking, these situations are presently the subject of litigation and may be inappropriate to discuss. The problem of the character of three islands (Upper, Middle and Shellmaker; Fig. 2) of tidal marsh in Upper Newport Bay, however, provides an example

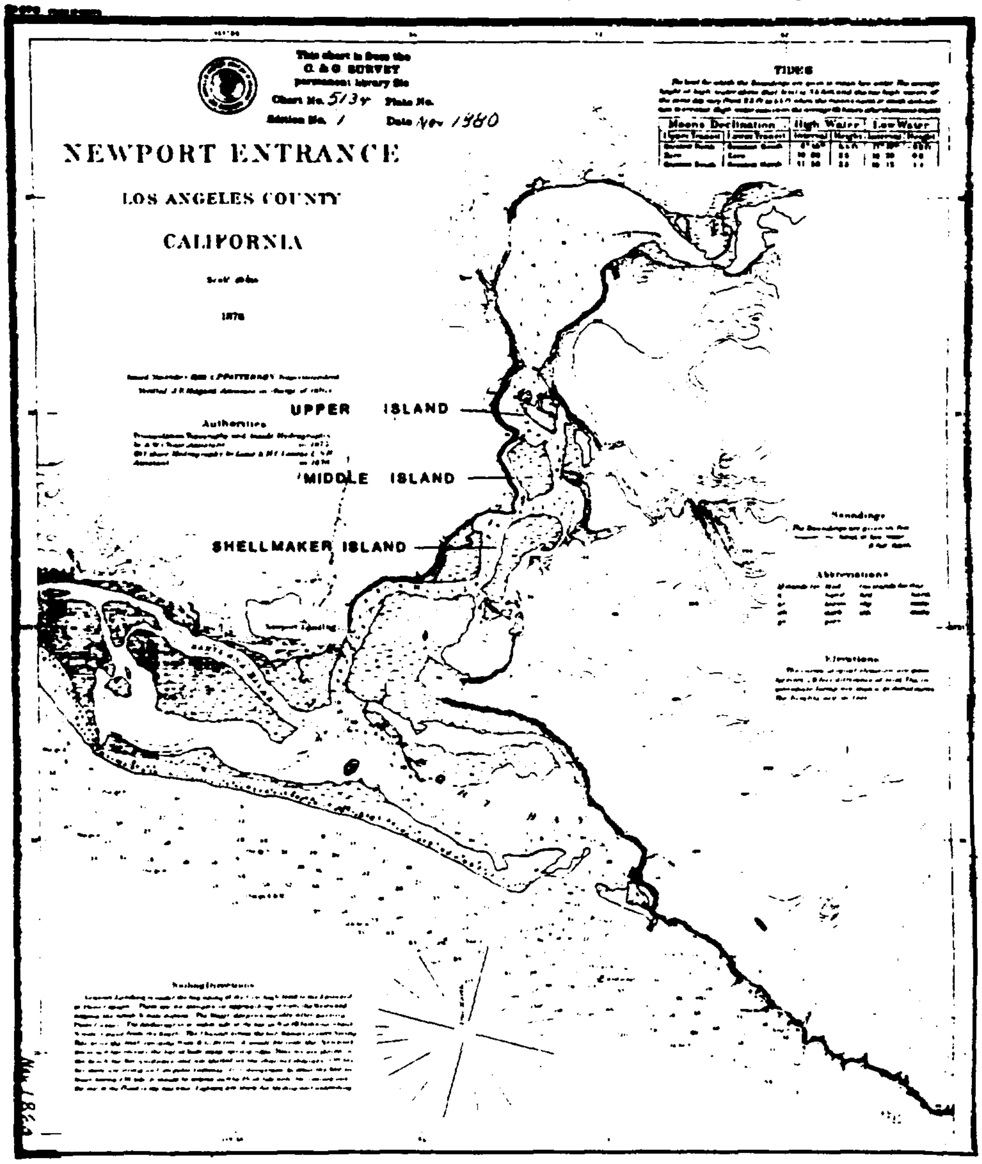


Fig. 2. Nautical chart of Newport Bay, California, published in 1878 by the U.S. Coast and ·eodetic Survey.

comparable to cases within San Francisco Bay. (The reader should bear in mind that the question of the character of the islands was but one aspect of a much larger title dispute, which entailed complicated questions of whether the lands were in fact validly purchased from the State, regardless of their character).

Upper Newport Bay, a tidal estuary, is part of the Newport Canyon. The canyon is the southeastern extremity of a lowland plain which is bounded on the northwest by the San Pedro Hills, thence sweeping inland to the coastal foothills.

The Bay is bounded by uplands, the titles to which were deraigned from rancho grants made by the Mexican government (the Rancho San Joaquin and the Ranchos Santiago de Santa Ana). Upper Newport Bay and the islands lying within it were not included within the patents to the ranchos. During the confirmation proceedings, however, Jose Sepulveda, the ultimate patentee of both ranchos, had claimed the Bay and an island within it. The claim was based in part on testimony of a witness that within the "Bolsa of San Joaquin" was a hummock, a type of island surrounded by marsh, that had been occupied by Sepulveda as a potrero, a place for keeping and raising horses. (Transcript of the proceedings in case No. 406, *Jose Sepulveda, claimant* vs. *The United States, Defendants* for the place named "San Joaquin" [185 SD p. 8].)

The Ranchos San Joaquin and Santiago de Santa Ana were surveyed for the federal government by Henry Hancock in 1857. The final approved plat of his survey does not show the islands in question, but since they were not included within either of the rancho grants it is not expected that they would have been shown. His field notes, however, include a crude sketch of islands in Upper Newport Bay.

An 1875 U.S. Coast Survey chart entitled "Hydrography of Newport Bay or Santa Ana Lagoon and approaches, scale 1:10,000, 1875," Register No. 1256, shows Upper, Middle and Shellmaker Islands delineated by an "apparent shoreline," an administrative surrogate for the actual mean-high-water line and in the companion topographic map, Register No. 1392, the islands are also delineated by an apparent shoreline and marked with the symbol for swamp.

The islands show on another 1875 map, this one prepared by Los Angeles County Surveyor L. Seebold in connection with an application for Tide Land Location 37. That application concerned lands south of the three islands and characterized the land surveyed as a "piece of swamp and overflowed land." The application states, however, that "... no part of the land sought to be purchased is below low tide ...," which indicates that the land applied for was probably tidelands. But the significant matter is that Upper, Middle and Shellmaker Islands are depicted in a distinctly different manner than the parcel sought to be purchased; an inference is that the islands were of a different character, possibly that they were thought to be swamp and overflowed.

An 1878 map prepared by Assistant Los Angeles County Surveyor Charles T. Healey shows the approximate sites of Middle and Shellmaker Islands as the "tideland locations of C. E. French." Although history has given Healey a reputation for doing his work in the field and not in the office (as was the practice of many of his contemporaries), the map places section lines and corners and many topographical features (including two of the islands, Middle and Shellmaker) approximately 10 chains west of their true position.[24] The map shows lots numbered 1 through 9 as French's tideland locations.

The configuration of Healey's Lot 5 resembles Shellmaker Island as it appeared on the later township plat, and Lot 7 generally resembles Middle Island as shown on the township plat. The State Lands Division has in its records an application to purchase these "tideland" lots, and the

[24] The most northeasterly island on Healey's map is shown in a much different place than is Upper Island on Finley's township plat, and this difference cannot be explained by Healey's placement of section lines and corners approximately 10 chains west of their true position. This difference (there is only a sliver of overlap) makes it impossible to determine whether these two islands were the same.

other Lots 1 through 9, under the name Survey Number 12. The application appears to be a copy; the blanks are filled in and signature of C. E. French is in quotation marks. On the cover of this application is the printed phrase "Swamp and Overflowed Lands." Between the words "overflowed" and "lands" a caret adds the words "and tide."

In 1889, Solomon H. Finley completed the Federal township survey of T6S, R10W, San Bernardino Meridian, which showed Upper, Middle and Shellmaker Islands as swamp-and-overflowed lands. There is some indication, however, that Finley surveyed an ordinary-low-water mark instead of the ordinary-high-water mark. This is the conclusion reached by Harris E. Coutchie in a report prepared for the Irvine Company dated August 1971 (*Id.* at p. 7). In addition, Finley may have legitimately believed he was to have surveyed the ordinary-low-water mark. The official government manual for surveyors in effect in 1889 was the General Land Office's 1881 Instructions of the Commissioner of the General Land Office to the Surveyors General of the United States Relative to the Survey of the Public Lands and Private Land Claims. On page 33 of the manual is an erroneous instruction that swamp-and-overflowed lands bordering on navigable lakes and rivers were to be meandered at the ordinary low-water mark.[25] Nothing in the manual, however, specifically treats of swamp lands on tidewaters. (See *People* vs. *Ward Redwood Co.*, 225 Cal. App. 2d 385, 390 [1964].)

Then in 1912, Otto Von Geldern, a renowned coastal engineer, prepared a plat of survey for the U.S. Army Corps of Engineers showing lands of the general shape of Upper, Middle and Shellmaker Islands as swamp. There are contour lines within the swamp, and the map legend states these contours are of a "spring high tide" elevation. If true, this is evidence that portions of the islands were above mean high water in 1912. (No contemporary cartographic manuals of the Corps have been examined.) Conceivably, however, Von Geldern may have actually mapped the mean high tide line.[26] If so, this would be the only historic mean-high-tide-line survey of Upper Newport Bay known to us.

Fortunately for the involved parties and any judge who might have had to try to impose order on this chaotic evidence, the dispute was resolved in 1975 in an out-of-court settlement.

TO THE SCIENTIST AND ENGINEER

When the law hears disputes relating to tidal marshes it thus has a vast need for the knowledge of the scientist or engineer on such questions as the natural physical and biological history of marshes, how they respond to man-made changes, and the roles they play in the hydrodynamics and sediment transport in the adjacent water body. The law applicable to a given problem may be intricate, and may change, if subtly, as facts are learned or as studies yield new data. For this reason, to assure that he probes the appropriate questions, the scientist or engineer should demand clear instructions from his client. He should ask for specific formulations of the questions he is to answer and assure himself that he understands them, lest his preparation be misspent in irrelevant or tangential inquiries. He should not tolerate an assignment, for example, simply to locate the "ordinary high water mark" of a parcel of land. He should ask the proper tidal datum to employ, and whether the line is to be located in the present condition, or in some former condition of the

[25] This instruction is repeated in the next (1890) edition of the manual. But the 1890 manual added an instruction that lands (not specifying swamp and overflowed lands) bordering on tidelands were to be meandered at the ordinary high-water mark. That the former instruction is erroneous is clear. *Barney* vs. *Keokuk*, 94 U.S. 325, 338 (1876).

[26] See Von Geldern, The Plane of Ordinary High Tide, etc., 29 Pacific Municipalities 243 (June 1915), and the rebuttal of D. E. Hughes, 29 Pacific Municipalities 340, 344 (August 1915).

land. By the same token he should be tolerant when the law has not caught up with knowledge, when it has not yet developed the sophistication to ask the proper question. Experts and not lawyers taught the Supreme Court the meaning of the tidal datum of MHW, and how that datum might be used to locate the law's—then—ethereal "ordinary high-water-mark." So when the law, as it frequently does, asks the scientist to square a circle, he should assume his duty to educate the law, to enable it to reshape itself and make its provisions congruent with the state of knowledge.

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request is served upon the clerk or secretary of the governing board, the meeting shall be public. Whether the matter is considered at an executive session or at a public meeting, the final action of the governing board of the school district shall be taken at a public meeting and the result of such action shall be a public record of the school district.

CHAPTER 1999

An act to repeal Section 10 of, and to add Section 10 to, the Hunters Point Reclamation District Act (Chapter 1573 of the Statutes of 1955), relating to the Hunters Point Reclamation District.

In effect September 11, 1957

[Approved by Governor July 8, 1957. Filed with Secretary of State July 10, 1957.]

The people of the State of California do enact as follows:

SECTION 1. Section 10 of the Hunters Point Reclamation District Act is repealed.

SEC. 2. Section 10 is added to said act, to read:

Sec. 10. When, if, and as any or all of the 200-foot railway right of way and all street areas in the Hunters Point Reclamation District have been reclaimed or filled, the Legislature hereby finds that the trust for navigation and fishery is hereby relieved as to such portion or portions reclaimed or filled.

The State Lands Commission is hereby authorized to grant to this district, to the City and County of San Francisco, or to any person, persons, or corporations, parcels of land, held by the State of California, within the district, upon payment therefor or there being granted to the State of California all right, title and interest of the district, the City and County of San Francisco, or of such person, persons, or corporations in other parcels of land lying and being in the City and County of San Francisco, except that in no event shall any state-owned lands be granted while they are submerged and except that adequate access shall at all times be retained to the then existing waterfront. Such lands to be conveyed to the State shall be of equal or greater value than lands conveyed by the State. The State Lands Commission shall determine the land to be conveyed by, and granted to, the State of California and the value of lands so respectively conveyed by, and granted to, the State of California, which determination shall be final, and, in the event of a deficiency in value of lands conveyed to the State, the State Lands Commission is authorized to accept cash in lieu of land, for the purpose of equalizing values. Any conveyance or exchange of land shall be valued at substantially the appraised market value of said lands as of December 31, 1957.

CHAPTER 2000

...roviding for the determination of th... and submerged lands conveyed in t... Beach, and making an appropr...

[Approved by Governor July 8, 1957. Filed... Secretary of State July 10, 1957.]

...le of the State of California do enact a...

...ON 1. The State Lands Commission ... daries of the tide and submerged la... the City of Long Beach by Chapter ... apter 102, Statutes of 1925, and Chap... The commission shall survey, mon... undaries of such lands.

... commission may bring any actions ne... such boundaries, and for that purpose ... unsel.

... commission shall report to the Legis... February 15, 1958, its progress in carry... of this act.

... sum of fifty thousand dollars ($50,0... out of the Investment Fund to the St... ...on for the purposes of this act.

CHAPTER 2001

...ct to add Chapter 5, commencing with S... ...le 7 of the Government Code, relating ... ...g, the financing thereof, the designation ... ...g areas, the selection of district planning ... ...wers and duties thereof.

[Approved by Governor July 8, 1957. File... Secretary of State July 10, 1957.]

...people of the State of California do enact a...

...ON 1. Chapter 5 is added to Title 7 ... Code, to read:

CHAPTER 5. DISTRICT PLANNING

Article 1. Declaration of Poli...

...00. In enacting this chapter it is th... ...ature to provide a means for solving prob... ...pment which are not confined to any ... ...d that city and county planning may ... ...e development of the State may proce... ...n.

CHAPTER LXXX.

An Act for the creation of a commission for the promotion of uniformity of legislation in the United States, and to appropriate money for its expenses.

[Approved March 9, 1897.]

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Commissioners for promotion of uniform legislation.

SECTION 1. Within thirty days after the passage of this Act the Governor shall appoint three commissioners, who are hereby constituted a board of commissioners by the name and style of "Commissioners for the Promotion of Uniformity of Legislation in the United States." It shall be the duty of said board to examine the subjects of marriage and divorce, insolvency, the form of notarial certificates, descent and distribution of property, acknowledgment of deeds, execution and probate of wills, and other subjects, to ascertain the best means to effect an assimilation and uniformity in the laws of the States, and to represent the State of California in conventions of like commissions to consider and draft uniform laws to be submitted for the approval and adoption of the several States; and to devise and recommend such other course of action as shall best accomplish the purpose of this Act.

Compensation.

SEC. 2. That said commission shall be allowed, for their traveling and other expenses in effectuating the object of this Act, a sum not exceeding five hundred dollars in the aggregate for any one year.

Appropriation.

SEC. 3. The sum of one thousand dollars is hereby appropriated for the expenses of said commission out of any moneys not otherwise appropriated.

SEC. 4. This Act shall take effect from and after its passage.

CHAPTER LXXXI.

An Act relinquishing to the United States of America the title of this State to certain lands.

[Approved March 9, 1897.]

The People of the State of California, represented in Senate and Assembly, do enact as follows:

Relinquishing title to certain State lands to the United States.

SECTION 1. All the right and title of the State of California in and to the parcels of land extending from high-water mark out to three hundred yards beyond low-water mark, lying adjacent and contiguous to such lands of the United States in this State as lie upon tidal waters and are held, occupied, or reserved for military purposes or defense, lying adjacent

for the promotion of
States, and to appro-

7.]

resented in Senate and
llows:

he passage of this Act
sioners, who are hereby
the name and style of
Uniformity of Legisla-
the duty of said board
d divorce, insolvency,
t and distribution of
cution and probate of
e best means to effect
aws of the States, and
n conventions of like
m laws to be submitted
several States; and to
of action as shall best

be allowed, for their
ting the object of this
ollars in the aggregate

ollars is hereby appro-
mmission out of any

n and after its passage.

I.

of America the title of
nds.

97.]

presented in Senate and
llows:

the State of California
from high-water mark
low-water mark, lying
of the United States in
nd are held, occupied,
lefense, lying adjacent

and contiguous to any island, the title to which is in the United States, or which island is reserved by the United States for any military or naval purposes or for defense, are hereby granted, released, and ceded to the United States of America; the boundaries of each parcel of land hereby granted, released, and ceded to the United States to be a line along high-water mark, a line three hundred yards out beyond low-water mark, and lines at right angles to high-water mark at the points where the boundaries of the adjacent lands of the United States touch high-water mark; *provided*, that the title to each parcel of land hereby granted, released, and ceded to the United States shall be, and remain in the United States only so long as the United States shall continue to hold and own the adjacent lands now belonging to the United States; *and provided further*, that this State reserves the right to serve and execute on said lands all civil process, not incompatible with this cession, and such criminal process as may lawfully issue under the authority of this State against any person or persons charged with crimes committed without said lands. Right to serve civil process.

SEC. 2. This Act shall take effect immediately.

CHAPTER LXXXII.

An Act authorizing the Common Council, Board of Trustees, or other governing body of any incorporated city or town other than cities of the first class to refund its indebtedness, to issue bonds therefor, and to provide for the payment of the same.

[Approved March 9, 1897.]

The People of the State of California, represented in Senate and Assembly, do enact as follows:

SECTION 1. The Common Council, Board of Trustees, or other governing body of any incorporated city or town other than cities of the first class, in this State, having an outstanding indebtedness, evidenced by bonds or warrants thereof, is empowered, by a two-thirds vote of its number, to fund or refund the same and issue bonds of such city or town therefor in sums of not less than one hundred dollars nor more than one thousand dollars each, and having not more than forty years to run, and bearing a rate of interest not exceeding six per cent per annum, payable semi-annually; *provided*, that no indebtedness shall be refunded at a higher rate of interest than that borne by the original debt. Such bonds shall be of the character known as "serials," not less than one fortieth of the principal being payable each year, together with the interest due on all sums unpaid. Principal and interest on said bonds shall be payable in gold coin or other lawful money of the United States, as may be expressed in said bonds, at the office of the Treasurer of said city or town. Said bonds shall be sold in the manner provided by such City Council or other governing body, to the

Refunding indebtedness of cities, other than of first class.

Character of bonds.

Attachment D
Analytical Report

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE, RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. 211

Received: 06/07/89
Reported: 06/19/89
Job #: 70875

Attn: George Wilson
Tom Amen
Yosemite & Armstrong
San Francisco, CA.

1mg = 1000 ug

Lab ID #: 70875-1
Client ID: MW-1 Monitor Well

ANALYSIS:

		MDL	MCL (ug/l)
PCB's as Aroclor 1260	3.7 mg/kg	0.5	0.5
Halogenated	ND<1.0 mg/kg	1.0	

MDL: Method detection limit; Compound below this level would not be detected.

QA/QC: Spike Recovery for PCB's: 90%

METHODS:
PCB Method EPA 8080
Halogenated by EPA 8010

Jaime Chow
Laboratory Director

Precision Analytical Laboratory, Inc.

4136 LAKESIDE DRIVE RICHMOND, CA 94806 PHONE (415) 222-3002 FAX (415) 222-1251

CERTIFICATE OF ANALYSIS

STATE LICENSE NO. 211

Received: 06/07/89
Reported: 06/09/89
Job #: 70875

Attn: George Wilson
Tom Amen
Yosemite and Armstrong
San Francisco, CA.

Analysis Method EPA 6010
Prep Method EPA 3050
mg/kg

Lab ID #: 70875-1
Client ID: MW-1 Monitor Well

METAL		MDL	% SPIKE RECOVERY
Tl	ND<2.2	2.2	70
As	ND<2.2	2.2	84
Hg	ND<5.0	5.0	84
Se	ND<5.0	5.0	78
Mo	ND<1.0	1.0	86
Sb	2.0	2.0	80
Zn	14.2	0.15	74
Cd	ND<0.012	0.012	78
Pb	16.9	1.1	80
Co	0.7	0.5	88
Ni	34.9	0.65	82
Cr	6.9	0.15	82
V	42.9	0.1	88
Be	ND<0.025	0.025	86
Cu	12.1	0.1	86
Ag	ND<0.1	0.1	76
Ba	8.2	0.1	92

MDL: Method detection Limit: Compound below this level would not be detected.

Jaime Chow
Laboratory Director

Attachment E
Health and Ecological Risk

HEALTH AND ECOLOGICAL RISK

This section provides a preliminary assessment of the human health and ecological risk associated with possible exposure to the potentially hazardous substances found in the soil and ground water near the San Francisco Bay Fill Area along Armstrong Avenue and Hayes Street.

Site Contaminants

Chemical analysis of the soil, ground water, and "floating" tar near the Armstrong Avenue and Hayes Street area indicated the presence of potentially toxic substances (borings 7, 8, and 10, Table 1). Soil and ground water concentrations are in mg/kg and mg/l, respectively, essentially equivalent to parts-per-million (ppm mass). The table also shows substances for which no measurements (NM) were obtained as well as measurements for which substances, if present, were less than the method detection limit. The first two pages of Table 1 list organic compounds under broad categories. The third page of Table 1 lists elemental composition under "inorganics" (compound information was not available). Where substances could not be detected (ND), the measurement method detection limit is given in parenthesis. For purposes of a conservative risk assessment, Table 1 lists maximum concentrations only.

Risk To Aquatic Marine Organisms

Estuary (salt marsh) wildlife species consist of vegetation such Cord grass, Alkali Bullrush, Pickle Weed, Jaumea, Salt Grass, Brass Button, Sea Lavender, Marsh Dodder, and animals such as crab, worms, shrimp, fish, mussels, oyster.

A rigorous quantitative ecological risk assessment is beyond the scope of this preliminary evaluation. Thus, to reduce the complexity of this task, the following conservative assumptions are used . . .

- o Site ground water is directly connected to estuary water.
- o The soil is sandy and porous.
- o No soil absorption occurs.
- o No loss of toxic substances as a result of evaporation and/or chemical-biological transformations.
- o No dilution.
- o Tidal action brings ground water in contact with unsaturated soil above "floating" contaminant.
- o Maximum site concentrations are compared to ambient ocean water quality criteria.

"Indicator" substances have been selected on the basis of their potential toxicity and available information regarding their biological effects on aquatic marine organisms (Table 2). A qualitative risk assessment is derived by comparing the maximum measured concentrations in the site ground water with the ambient ocean water quality criteria for each indicator substance. If the measured concentration is less than the criterion, then it is quite unlikely that any damage to marine organisms will occur as a result of exposure to the "indicator" substance. However, a measured concentration greater than the criterion, allows for the possibility that some adverse effect could occur to some marine species as a result of exposure to the "indicator" substance. But note that owing to the numerous conservative assumptions used in this risk assessment, this latter occurrence (of site concentrations greater than the criterion) does not mean that harmful effects are likely (only possible).

The following is a brief explanation of the data in Table 2. Ambient ocean water quality criteria are derived from the U.S. EPA Integrated Risk Information System (IRIS). Acute (short-term) and chronic (long-term) numerical values are 1-hour and 4-day exposure averages, respectively. These are exposure concentrations for which no observable adverse effects have occurred (NOAEL). Effects on specific species are usually expressed as LC_0* estimated conservatively as 1/10 of the LC_{50}** value. For the listed organics, these data are from Verschueren's handbook of environmental information on organic chemicals. (Photosynthesis inhibition is the only effect considered for algae.) Owing to significant differences in their toxicity, chromium(III) and chromium(VI) are listed separately (total chromium concentration in the site ground water is 6.9 mg/l).

As Table 2 suggests, exposure to lead (and to a lesser extent, chromium) may adversely affect some aquatic marine organisms. And although mercury bioaccumulates in fish, there are no known toxic effects. Toxicity to marine organisms form exposure to nickel and zinc is unknown.

Regarding exposure to organic contaminants, it appears that xylene concentrations may just be high enough to possibly affect shrimp and crab larva (the volatility of benzene makes it unlikely that concentrations in estuary water will be high enough to have any significant effects). Some polycyclic aromatic hydrocarbon (PAH) site concentrations of pyrene, fluoranthene, and naphthalene may adversely affect some exposed marine organisms. However, the available data are too limited to be of much use in performing a risk assessment. And although polychlorinated biphenyl (PCB) is known to bioaccumulate in fish, no adverse aquatic toxic effects have been observed.

---

*LC_0 = Lethal Concentration for which a 96-hour exposure killed <u>no</u> organisms, essentially a NOAEL.

**LC_{50} = Lethal Concentration for which a 96-hour exposure killed 50% of the organisms.

Table 1. Measured maximum concentrations of potentially hazardous substances at the San Francisco Bay Fill Area along Armstrong Avenue and Hayes Street

ORGANICS

substance	concentration (soil) mg/kg	concentration (ground water) mg/l
MONOCYCLIC AROMATIC HYDROCARBON		
benzene	0.66	0.8
toluene	0.90	0.14
xylene	ND (<0.05)	1.2
ethylbenzene	ND (<0.05)	1.0
POLYCYCLIC AROMATIC HYDROCARBON (PAH)		
naphthalene	ND (<10)	2.7
acenaphthene	NM	ND (<0.005)
acenaphthylene	ND (<10)	0.19
fluorene	ND (<10)	0.38
anthracene	ND (<10)	1.6
phenanthrene	ND (<10)	0.82
fluoranthene	ND (<10)	1.3
pyrene	ND (<10)	1.0
chrysene	ND (<10)	0.36
benz(a)anthracene	NM	0.066
benzo(a)pyrene	NM	ND (<0.01)

Table 1. (continued)

ORGANICS

substance	concentration (soil) mg/kg	concentration (ground water) mg/l
CHLORINATED ORGANICS		
monochlorobenzene	0.15	NM
1,4-dichlorobenzene	0.16	ND (<0.0005)
pentachlorophenol	ND (<10)	ND (<0.0005)
1,1-dichloroethylene (1,1-DCE)	ND (<0.02)	0.2
tetrachloroethylene	0.38	NM
polychlorinated biphenyl (PCB)	ND (<0.1)	3.7
2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)	NM	ND (<0.005)
OTHER		
di(2-ethylhexyl) phthalate (DEHP)	NM	0.096
total petroleum hydrocarbon	680	NM

Table 1. (continued)

INORGANICS

"element"	concentration (soil) mg/kg	concentration (ground water) (mg/l)
arsenic	24	ND (<2.2)
antimony	1.4	2.0
beryllium	0.4	ND (<0.025)
barium	NM	8.2
cadmium	12	ND (<0.012)
chromium	50	6.9
copper	440	12.1
mercury	0.039	ND (<5.0)
lead	230	16.9
nickel	140	34.9
silver	0.8	ND (<0.1)
selenium	ND (<0.1)	ND (<5.0)
thallium	0.05	ND (<2.2)
vanadium	NM	42.9
zinc	7,400	14.2
cyanide	4.0	NM

NM = not measured

ND = not detected

Table 2. Estimate of risk to aquatic estuary/ocean organisms

INORGANICS

"element"	concentration measured (ground water)	ambient ocean water quality criteria	likelihood of possible harm to marine species
	mg/l	mg/l	yes/no
lead	16.9	acute: 0.14 (1 h) chronic: 0.0056 (4 d)	yes yes
chromium(VI)	1.3*	acute: 1.1 (1 h) chronic: 0.05 (4 d)	yes yes
chromium(III)	5.6*	acute: 1.0 (nonsea) chronic: 0.1 (nonsea)	yes yes
mercury	0.039	marine toxicity unknown; bioaccumulation in fish	no
nickel	34.9	marine toxicity unknown	unknown
zinc	7,400	marine toxicity unknown	unknown

*assumption: chromium(III)/chromium(VI) = 6/1

references: 1. Integrated Risk Information System (IRIS) November 7, 1989

2. Karl Verschueren, "Handbook of Environmental Data on Organic Chemicals", 2nd edition (1983), Van Nostrand Reinhold Company Inc., New York, NY

Table 2. (continued)

ORGANICS

substance	concentration measured (ground water)	ambient ocean water quality criteria	likelihood of possible harm to marine species
	mg/l	mg/l	yes/no
benzene	0.8	acute: 5.1	no
		chronic: 0.7	yes
		algae: >1,400	no
		crab larva: 11 (LC_0)**	no
		shrimp: 2 (LC_0)**	no
toluene	0.14	crab larva: 3 (LC_0)**	no
		shrimp: 0.4(LC_0)**	no
		Coho Salmon: 10 (LC_0)	no
xylene	1.2	shrimp: 0.2 (LC_0)**	yes
		algae: >5**	no
		crab larva: 0.6 (LC_0)**	yes
ethylbenzene	1.0	algae: >33	no
		Bluegill: >33 (nonsea)	no

**conservative assumption: $LC_0 = LC_{50}/10$

no effect on photosynthesis = 50% effect/10

Table 2. (continued)

ORGANICS

substance	concentration measured (ground water)	ambient ocean water quality criteria	likelihood of possible harm to marine species
	mg/l	mg/l	yes/no
naphthalene	2.7	algae: >3**	no
		Neanthes Arenaceodentata: >0.5	yes
fluoranthene	1.3	Neanthes Arenaceodentata: >0.5	yes
anthracene	1.6	algae: inhibit photosynthesis?	no
		trout: >5 (24 h)	no
		oyster: bioaccumulation	no
pyrene	1.0	Mosquito Fish: >0.003	yes
chrysene	0.36	Neanthes Arenaceodentata: 3.3**	no
benzo(a)pyrene (BaP)	ND (<0.01)	marine toxicity unknown	unknown
1,1-dichloroethylene (1,1-DCE)	0.2	Menidia Beryllia: 25 (LC_0)**	no
		nonsea fish: 22 (LC_0)**	no
polychlorinated biphenyl (PCB)	3.7	fish: toxicity unknown; bioaccumulation	no

**conservative assumption: $LC_0 = LC_{50}/10$

no effect on photosynthesis = 50% effect/10

Risk To Children

Historically, this South San Francisco coastal area has been an industrial/storage region. Therefore, it is a relatively low-population area and few children would be expected to play near the contaminated site. Nevertheless, children playing in the nearby soil is possible and thus, an estimate of health risk is discussed in this section. The following conservative assumptions have been used for purposes of this risk assessment . . .

- Child has a mass of 10 kg.
- Child ingests 0.1 g of soil per day over a 70-year lifetime.
- Maximum site concentrations are compared to No Observable Adverse Effect Level (NOAEL) or Reference Dose (RfD).
- For indicator substances that could not be detected (ND), it was conservatively assumed that the substance was present in the site soil at a concentration equal to the analytical detection limit.
- The buried contaminated soil has been brought to the surface catastrophically or by excavation.
- The surface soil has become contaminated as a result of tidal effects or upward "wicking".
- Only "human" NOAELs were used for comparisons. Such NOAELs are usually based on animal test data, and typically incorporate conservative safety factors of 1,000.

Although inhalation and skin absorption are possible routes of exposure, they are not likely since the "floating" tarry product is one meter or more beneath the surface and once brought to the surface (e.g., via excavation), the volatile substances would soon be lost to the atmosphere (assessment of chronic effects generally assume a lifetime exposure). Consequently, ingestion will be the only route of exposure considered for assessing the health risk to children.

As for the earlier risk-to-marine-life assessment, "indicator" substances have been selected on the basis of their potential toxicity, available information, and level of concentration at the site in the soil (Table 3). A qualitative risk assessment is derived by comparing the maximum measured concentration in the site soil with the NOAEL or RfD for each indicator substance. For indicator substances that were not analytically detected, it was conservatively assumed that they were present at concentrations equal to their analytical detection limits.

Where possible, in order to minimize the complexity of this assessment, only the toxicological end-points, cancer and birth defects, are considered. A quantitative risk was estimated only for cancer where an oral cancer potency factor (q^*) was known for the indicator substance. The following is an example calculation of the risk of getting cancer as a result of exposure to an indicator substance . . .

Table 3. Estimate of health risk (via ingestion) to child

ORGANICS

substance	concentration measured (soil) mg/kg	exposure (soil eaten) mg/d	NOAEL (RfD) mg/d	cancer potency factor $(mg/kg/d)^{-1}$	risk
benzene	0.66	6.6E-5	2.35	2.9E-2	cancer: 1.9E-7 <NOAEL
1,1-DCE	<0.02	2.0E-6	0.0009	6.0E-1	cancer: 1.2E-7 <NOAEL
PAH (BaP)	<10	1.0E-3	0.05	unknown	cancer: unknown <NOAEL
PCB	<0.1	1.0E-5	0.1	7.7E+0	cancer: 7.7E-6 <NOAEL

NOAEL = No Observable Adverse Effect Level

RfD = Reference Dose: an estimate of daily exposure to humans that is likely to result in no significant harmful effects during a lifetime

references: 1. "Toxicological Profiles for PCB, 1,1-dichloroethylene, benzene, and benzo(a)pyrene", U.S. EPA draft document prepared for the Agency for Toxic Substances and Disease Registry (ATSDR)

2. IRIS (November, 1989)

Table 3. (continued)

INORGANICS

"element"	concentration measured (soil) mg/kg	exposure (soil eaten) mg/d	NOAEL (RfD) mg/d	cancer potency factor $(mg/kg/d)^{-1}$	risk
lead	230	2.3E-2	1.0E-4	unknown	cancer: slight >NOAEL
zinc	7,400	7.4E-1	11E+0	unkown	<NOAEL
chromium(VI)	8.3*	8.3E-4	5.0E-2	4.1E+1	cancer: 3.4E-3 <NOAEL
chromium(III)	41.7*	4.2E-3	15E+0	unknown	<NOAEL
mercury	0.039	3.9E-6	3.0E-3	unknown	<NOAEL
nickel	140	1.4E-2	2.0E-2	unknown	<NOAEL

*assumption: chromium(III)/chromium(VI) = 6/1

references: 1. IRIS (November 1989)

2. "Toxicological Profiles for lead, zinc, chromium, mercury, and nickel", U.S. EPA draft document prepared for the Agency for Toxic Substances and Disease Registry (ATSDR)

Lifetime Cancer Risk = (q*)(exposure) ....(1)

Since q* is in units of $(mg/[kg\ body\ mass]/d)^{-1}$, exposure must be in units of (mg/[kg body mass]/d), for lifetime risk to be unitless. Assuming that the exposure is to a 10-kg child, the listed values of exposure in mg/d (Table 3) can be converted to mg/kg/d as follows:

mg/kg/d = (mg/d)/(10 kg) ....(2)

The following is an example calculation of the incremental risk of a child ingesting benzene from the site contaminated soil.
Benzene Ingested = (concentration in soil)(soil mass ingested)

= (mg/kg)(kg/d) ....(3)

= $(0.66\ mg/kg)(0.1 \times 10^{-3}\ kg/d)$

= 6.6×10^{-5} mg/d

= 6.6E-5 mg/d in engineering exponent notation

And using equation 2, the exposure for a 10-kg child in terms of mg/kg/d is:

= $(6.6 \times 10^{-5}\ mg/d)/(10\ kg)$

= 6.6×10^{-6} mg/kg/d

And substituting into equation 1:

Lifetime Cancer Risk = $(2.9 \times 10^{-2})(6.6 \times 10^{-6})$

= 1.9×10^{-7}

= 1.9E-7 in engineering exponent notation

This means that the estimated chance of getting incremental cancer during the child's lifetime from daily ingestion of the benzene-contaminated soil is about 2 in 10 million. Or in an exposed population of 10 million children, 2 children will get cancer as result of this type of exposure.

Regarding reproductive effects, only lead showed >NOAEL. The other indicator substances all resulted in <NOAEL. And only exposures to chromium(VI) had potentially significant (<1:100,000) risk of getting cancer. Zinc and chromium(III) are essential trace elements for human health.

Health Risk To General Populace

Because this South San Francisco coastal area has never been and probably will never be used as a source of drinking water, contamination of the ground water is unlikely to be a significant hazard to adult humans near the contaminated site. The only possible route of exposure for people occupying new buildings near the contaminated site is inhalation. As a result of excavation or a catastrophic event (e.g., earthquake), volatile components of the tarry "floating" product may be released, finding their into a building through air intakes, open windows, or foundation cracks. Such exposures would be essentially to the volatile organics and not to the involatile inorganics (elements or metals). Of possible greater concern, is the potential exposure to excavation workers. During operations, they might inadvertently expose themselves to hazardous components of the tarry "floating" product or to contaminated soil. Here, besides inhalation, is the possibility of dermal exposure.

The volatile, potentially hazardous substances found at the site are benzene, toluene, xylene, ethylbenzene, 1,1-dichloroethylene, tetrachloroethylene, and naphthalene. Of these, only benzene and 1,1-dichloroethylene pose any significant threat of cancer. Short-term exposure to these two toxic substances are unlikely to be harmful. A quantitative health risk would use inhalation cancer potency factors (q^*) along with estimated exposures (mass and duration). This is currently not within the scope of this effort. Inhalation exposure to nonvolatile toxic inorganics may occur from dust generated during excavation operations.

Summary Of Health-Ecological Risk And Recommendations

This preliminary risk assessment suggests that there may be some adverse effects to marine and human life as a result of exposure to some toxic substances from the Armstrong/Hayes area.
The contaminants of greatest concern appear to be lead and chromium. However, the available data are much too sparse to provide a true quantitative risk assessment. Recommendations are as follows:

- More sampling and chemical analyses to provide statistically defendable information.

- Increase the sensitivity of the chemical analytical method for PAH in soil.

- Determine the compound form (at least the valence state) for the most toxic "elements".

- Remediation will be guided by an accurate risk assessment.

SOURCES OF CONTAMINANTS

This section delineates possible sources of the contaminants found at the Armstrong/Hayes South San Francisco Bay fill area. Because of the proximity of a lumber yard, additional detail is provided regarding the possibility of contaminants from past wood operations.

Lead

- Mining operations
- Storage batteries
- Ammunition
- Solder
- Pipes (old)
- Gasoline additive

Zinc

- Smelting operations
- Foundries (brass alloying)
- Metal plating
- Welding operations
- Galvanized metal containers

Mercury

- Thermometers
- Barometers
- Medical/Dental operations
- Industry
- Bioaccumulated in fish
- Naturally occurring

Nickel

- o Mining operations
- o Steel manufacturing
- o Electroplating
- o Nickel-Cadmium batteries
- o Permanent magnets
- o Fuel oil (diesel)
- o Medical-Dental operations
- o Consumer products

Chromium

- o Mining operations
- o Steel manufacturing
- o Pigments
- o Leather tanning
- o Wood treatment
- o Water treatment (e.g., cooling towers)
- o Plating operations
- o Metal/Glass cleaning

Benzene

- o Gasoline
- o Solvent (e.g., paint stripper)
- o Chemical industry
- o Manufactured-gas waste sites

1,1-Dichloroethylene

- o Plastics (e.g., Saran wrap)
- o Flame retardant fabrics
- o Solvent
- o Adhesives

PCB

- o Transformers
- o Capacitors
- o Fluorescent light ballasts

PAH

- o Fossil fuel combustion product
- o Coal tar
- o Wood treatment (creosote)
- o Asphalt
- o Manufactured-Gas waste sites

Wood Treatment Operations

What evidence is there to suggest that the nearby lumber yard has contributed some of the contaminants on the Armstrong/Hayes site? The following briefly discusses the chemicals that are used in typical wood treatment operations. These are compared to the contaminants found at the Armstrong/Hayes site.

While wood treatment operations are quite diverse, there are three major chemicals that are most successfully used to preserve wood. These are:

- Pentachlorophenol
- Creosote
- Copper/Chromium/Arsenic salts

Copper, chromium, and arsenic are indeed found at the contaminated site. And some components of creosote (the PAH) are also present at the site. But creosote is basically a mixture of phenols, with only minor amounts of PAH. Phenols (including pentachlorophenol) were not found at the site. This, reduces the likelihood that the nearby lumber yard is significant contributor of contamination to the Armstrong/Hayes site.

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Vol. 2

**YOSEMITE AND FITCH SEWER CONSTRUCTION
INVESTIGATION OF HAZARDOUS WASTE
AND MITIGATION RESULTS**

ERM-West

Ref. #4

YOSEMITE AND FITCH SEWER CONSTRUCTION
INVESTIGATION OF HAZARDOUS WASTE
AND MITIGATION RESULTS

For City and County of San Francisco
Public Works Department
Industrial Waste Division

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1987

author - Dan Hinrichs
1987

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EXECUTIVE SUMMARY

The Yosemite Outfalls Consolidation Project was located within the jurisdiction of the Maher Ordinance. This ordinance requires an investigation for toxic and hazardous wastes where soils will be disturbed or built on. An investigation was completed and contamination was found in the form of creosote and diesel fuel. The contamination was removed from the soil and groundwater along the sewer construction route. The quantity of contaminated soil for disposal was minimized by a sorting and treatment process. The remediated soil was then used for backfill in the project.

Worker safety was provided by monitoring the air within the pipeline excavation. No toxic compounds were detected except on one occasion. The area was evacuated for a Friday afternoon, as a precautionary measure after high volatile organic levels were detected. Work resumed the following Monday.

INTRODUCTION

ERM-West was contracted by the City and County of San Francisco (City) to complete an investigation for toxic and hazardous wastes along the Yosemite and Fitch sewer line project route. This work was completed to meet the requirements of the Maher Ordinance. The project was expanded to include removal and treatment of waste material and monitoring of excavated areas for compounds that could be hazardous to worker health.

MAHER ORDINANCE

The Maher Ordinance was passed by the City and County of San Francisco Board of Supervisors. Its purpose is to ensure that developers of properties within previously landfilled portions of the Bay would complete hazardous waste investigations prior to project construction. The Public Works Department does the same for its construction projects.

The analyses required by the Maher Ordinance are as follows:

1. Inorganic Toxic Substances (priority pollutant metals)
2. Volatile Organic Toxic Pollutants (purgeable halocarbons and purgeable aromatics)
3. Total Petroleum Hydrocarbons
4. PCB's
5. pH
6. Flammability
7. Cyanides
8. Sulfides

PROJECT APPROACH

The approach consisted of development of a site history, completion of sampling and analyses, interpretation of data, and later, mitigation. The site history was prepared by Dr. Norman Grib, special consultant to the City. The site history consisted of identification of previous industries along the Outfall Line construction route. Locations of key industries were used to determine the sampling plan. For instance, there was a drum recycler along the route. This recycler had been included on the Superfund list. The California Department of Health Services (DHS) report identified chlorinated solvents in soils and groundwater below the site. A boring was completed within the project route near the site boundary and samples were taken and analyzed.

Under certain circumstances, other analyses were performed. For example, polynuclear aromatic hydrocarbons (PAH's) were analyzed in creosote waste.

The initial sampling and analyses were completed to determine if there were any problem areas. Once problem areas were identified, further work was planned. At this point, timing became critical since the contractor had begun working on the project. Since the sewer line was 20 ft. by 20 ft. cast-in-place concrete box, there was no variation possible in the route taken for the line. The project approach was expanded to include monitoring of the atmosphere in the excavations and definition of problem areas for mitigation.

As the excavation progressed, the atmosphere was monitored by using a flame ionization detector (OVA) and Draeger tubes. the greatest concern was in the 30 ft. plus excavation near the Superfund site. The compound of primary concern was vinyl chloride. Other solvents could also have been detected with the OVA. The monitoring was accomplished primarily by City staff with assistance from ERM-West staff.

INVESTIGATION RESULTS

Waste creosote and diesel fuel were found near the intersection of Armstrong and Hawes. Further borings, sampling and analyses were completed to define the extent and better characterize the waste. With this information, a mitigation plan was developed and implemented. The mitigation plan required removal of waste to allow continuation of construction and classification, treatment, and disposal of wastes.

The results of the soil investigation work were presented in a report to the City in January, 1987 (Appendix A). Further testing was completed and a mitigation report was prepared in March, 1987 (Appendix B). Waste creosote was found in the soil and groundwater in the vicinity of Armstrong Avenue and Hawes Street. There was also some diesel fuel mixed in with the creosote.

One problem in the mitigation process was that the City owned only the property in the streets. Groundwater contamination or contamination in soils was found on both sides of the property lines (see Figure 1). Neither the source nor the extent were proven, but contamination was on the property line and presumed to continue into the adjacent property. The City staff wanted to pump creosote and contaminated water for treatment but the landowner refused access. Thus, mitigation was confined to city property.

REGULATORY AGENCY COORDINATION

Upon completion of the Phase 2 investigation, contact was made with several regulatory agencies. The USEPA Region IX office delegated their review to the Department of Health Services (DOHS). The San Francisco Bay Regional Water Quality Control Board also delegated their role to the DOHS. The DOHS Toxic Substance Control Division (TSCD) was the agency that set

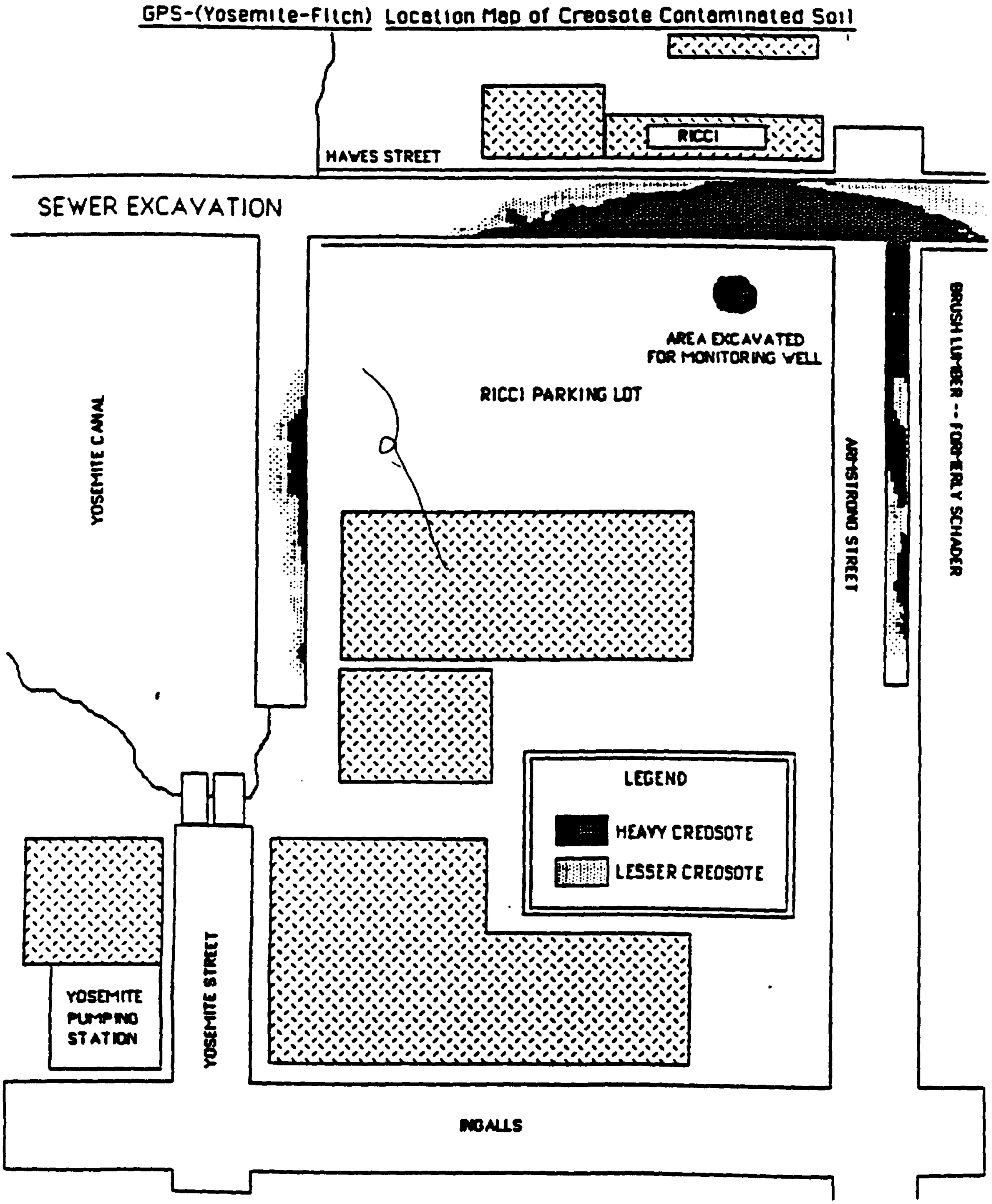


FIGURE 1

Extent of Creosote Contamination at Armstrong & Hawes mitigation standards for this project. The TSCD was also the lead agency for the drum recycler Superfund site at Thomas and Hawes. The contact for mitigation was Howard Hatayama. The contact for the Superfund site was Cliff Davenport.

Mr. Davenport provided information on results of the Superfund investigation. With the information provided, a monitoring program was developed to insure worker safety in the excavation. This program was incorporated into the Health and Safety Plan and is included in Appendix C.

Mr. Hatayama provided requirements for classification of soils as hazardous or non-hazardous. A level of 100 mg/kg of total petroleum hydrocarbons was the upper limit for soils to be classified as non-hazardous. All polynuclear aromatic hydrocarbons (PAHs) in the soil were to total less than 10 mg/kg. This was later changed to the total of the carcinogenic PAHs less than 10 mg/kg.

The entire project was coordinated with Mr. Bill Lee of the City and County of San Francisco Health Department. He assisted by evaluating all of the results outside of the creosote contamination. He participated in review of the criteria set by the DOHS.

When the creosote contamination was confirmed at Armstrong and Hawes, division staff notified the responsible parties in accordance with Proposition 65.

MITIGATION

Groundwater

Based on the Phase 2 investigation results, creosote and diesel fuel were found floating on groundwater in the vicinity of Armstrong and Hawes. Three four-inch extraction wells were installed at the locations shown on Figure 2. A facility was constructed to receive pumped water and separate the creosote and fuel from the water. Separation was accomplished by pumping to either of two Baker tanks. The Baker tanks were open-top tanks which provided a quiescent zone to allow flotation of the creosote and light fractions of fuel. This material was skimmed from the top of the tanks and placed in 55-gallon drums. The 55-gallon drums were shipped to disposal. Disposal was completed by incineration. No product was taken to a landfill, thus there is no long term liability.

The three small pumps were frequently clogging with large particles or globules of product. The three small pumps were replaced by two larger pumps with ability to pump without clogging (see Figures 2 and 3). The pump locations were modified slightly based on excavation and observations with a backhoe. The goal was to remove the liquid as quickly and completely as possible so that the construction project would not be delayed. One well was inadvertently placed on Ricci property. The location was determined by measuring from the fence on the opposite side of Hawes Street. The fence was assumed to be the property line. Since the fence was approximately 10 feet onto the city property, the well was placed a like distance onto private property on the northwest side of Hawes Street.

The treated water was then discharged to the sewer system. This water was monitored by the Industrial Waste Division staff. The discharged water received further treatment at the Southeast Treatment Plant. Test results of discharged water are shown in Appendix D.

Soils

Questionable areas were excavated and materials temporarily stored in a controlled area on the southerly corner of Armstrong and Hawes. The area was bermed and lined with two layers of plastic

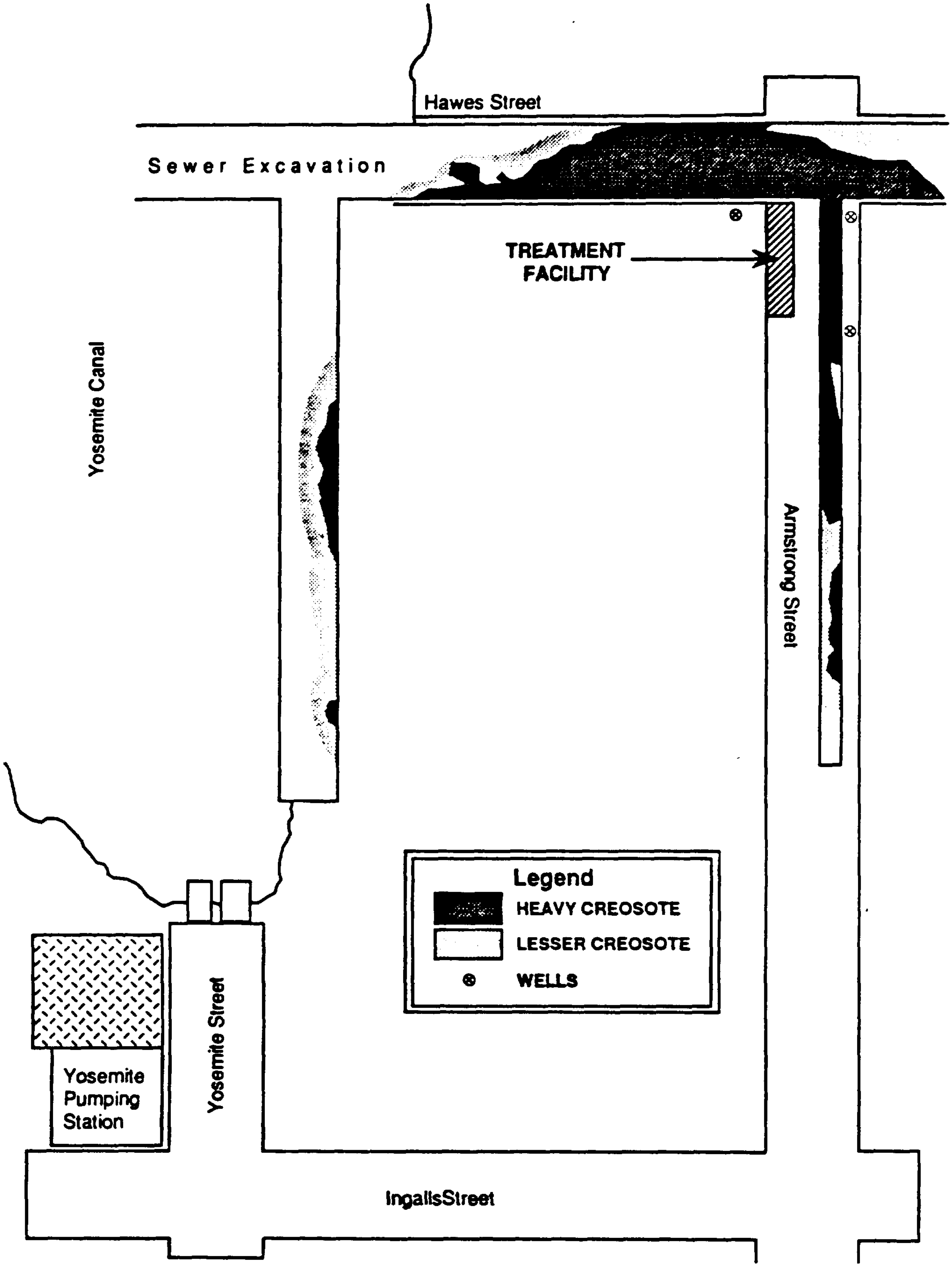


Figure 2
Small Well Locations

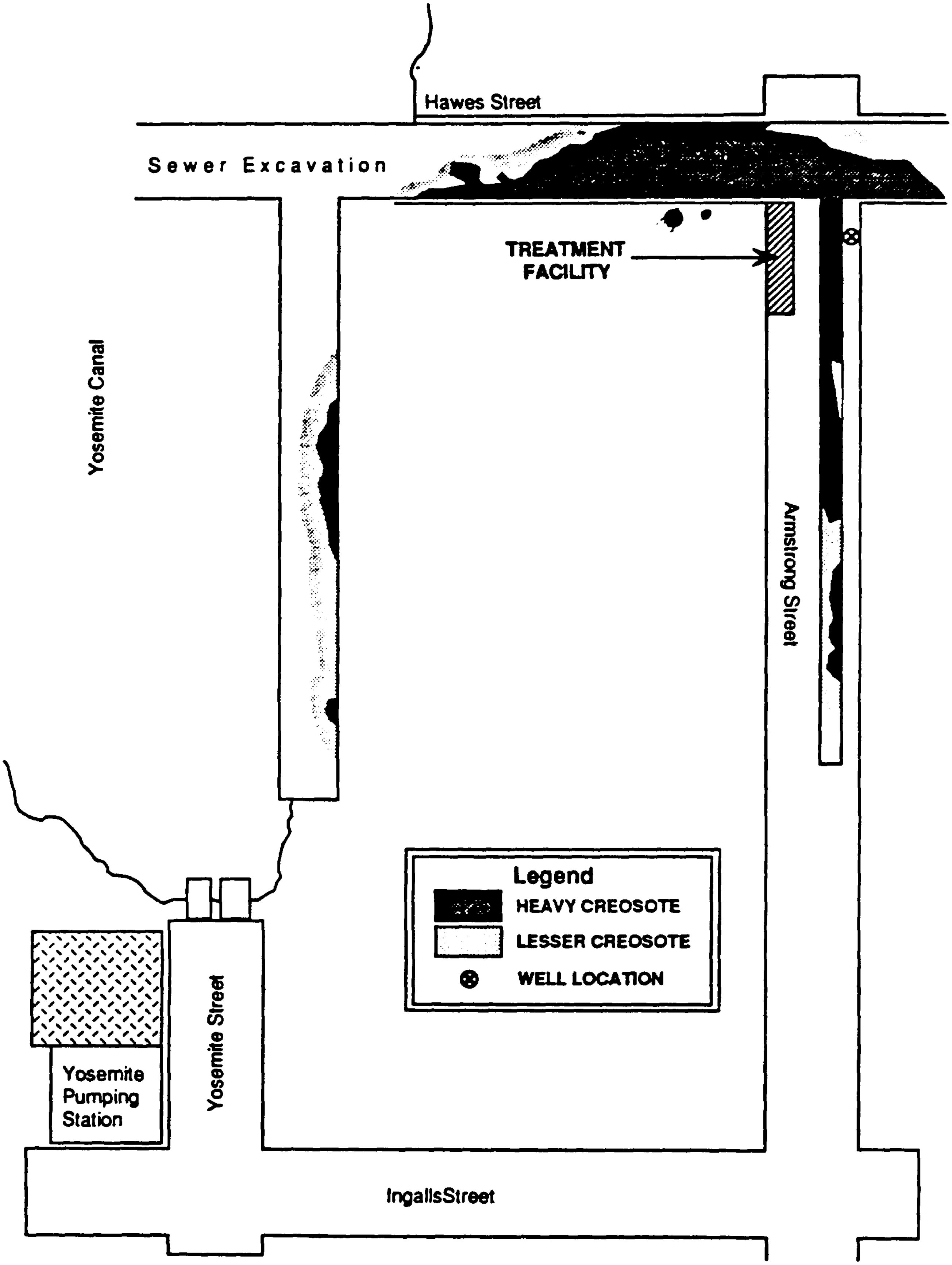


Figure 3
Large Well Locations

liner. After drying, the material was transferred to another area on the job site, but within the contractor's operations yard. At this area, materials were sorted. Large pieces of debris were separated for disposal. Soil was stockpiled, dried and mixed. Some treatment was accomplished by this process. The major contaminants were diesel fuel and creosote. Diesel fuel readily breaks down by bioremediation. Creosote compounds consist of a variety of polynuclear aromatic hydrocarbons (PAH's). Those compounds with 4 benzene rings or more are very resistant to bioremediation. Lighter fractions will volatilize and those compounds with 3 or fewer benzene rings are readily broken down by bioremediation. The four-ring compounds reduce to 3 or fewer rings when exposed to sunlight. Thus by mixing the piles, maximizing exposure to sunlight, and providing an environment conducive to bioremediation, the concentrations of creosote and diesel were reduced to acceptable levels. The sampling grid and one example of mixing are shown on Figure 4. The retention area plan and section are shown on Figure 5. The acceptable level was the sum of all PAH's less than 10 mg/kg in soil. This was later modified to less than 10 mg/kg carcinogenic PAH's.

The goals of 10 mg/kg carcinogenic PAH's and 100 mg/kg of TPH were met on all soil except 126 cubic yards which was hauled to a Class I landfill at Casmalia, CA.

COSTS

The total cost for project mitigation was $364,592.31. This includes all contractor, subcontractor, and city materials and labor. A detailed list of costs is shown on Table 1. Out of approximately 6,000 cubic yards of contaminated soil, only 126 cubic yards were transported to a hazardous waste landfill. The disposal cost was $35,532 or $282 per cubic yard. If the entire 6,000 cubic yards were hauled to an approval landfill, the total cost would have been $1,692,000. Of the $364,592.31, approximately $260,000 was spent on sorting, treating, reducing

GRID GUIDELINE

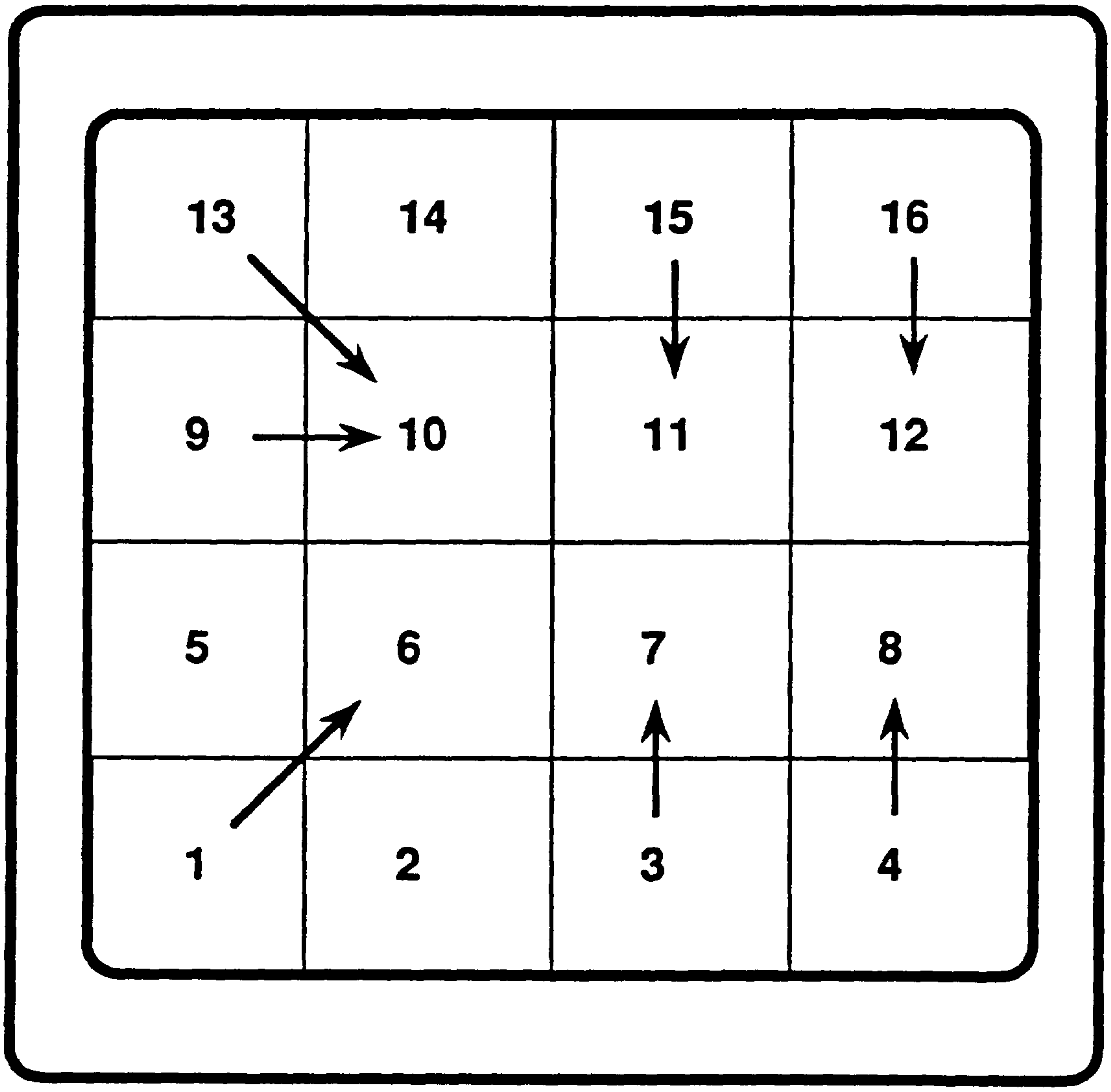


Figure 4

Soil Sorting/Decontamination Grid

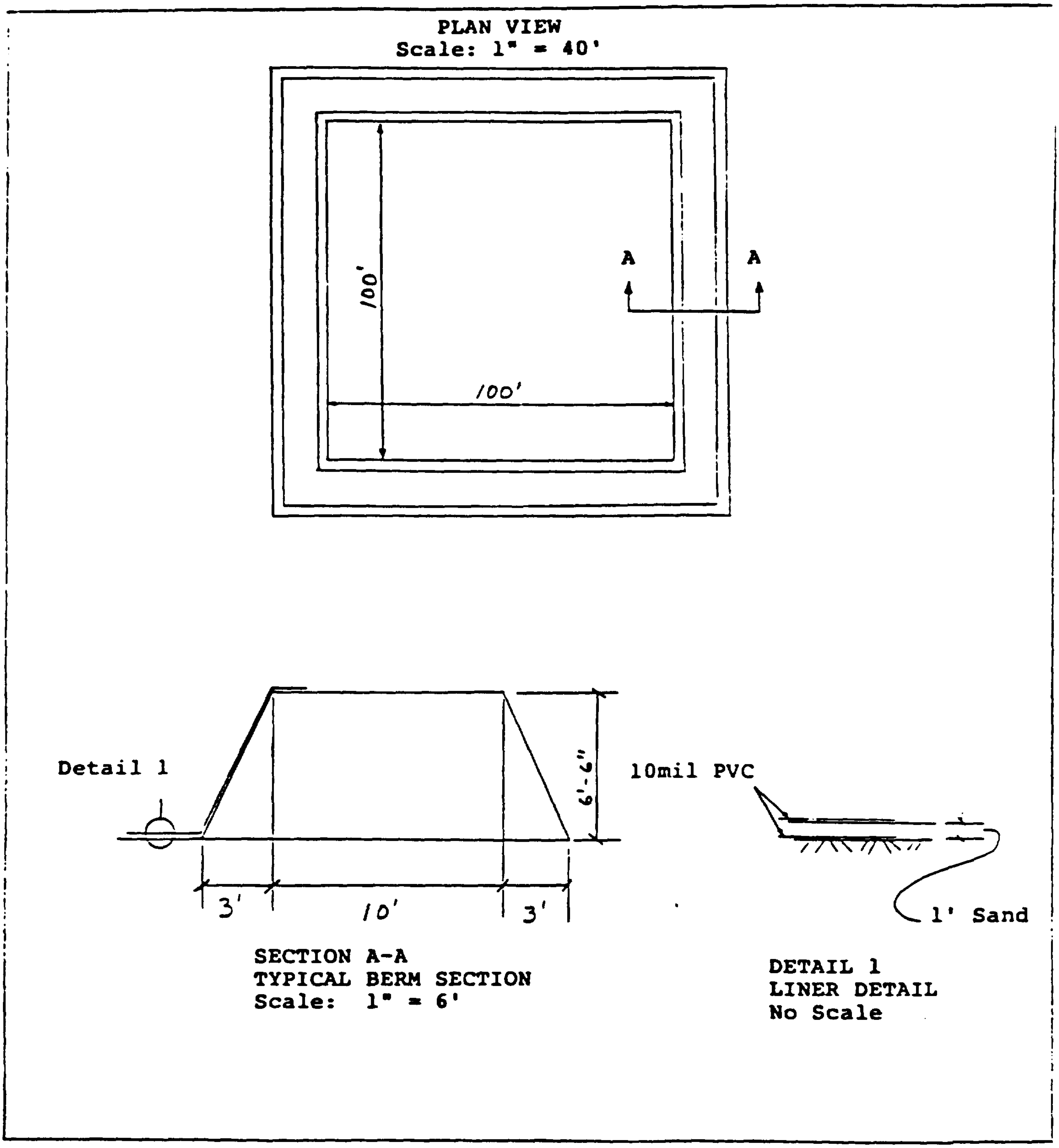


Figure 5
Retention Area for Contaminated Soil

the quantity of contaminated soil to be removed, and disposing of the remaining contaminated soil. In addition to the cost savings, the long term liability of hazardous waste disposed at a landfill is reduced by the reduced volume.

TABLE 1

Yosemite-Fitch Outfalls Consolidation Project

Phase 1 -- (10/1/86 to 1/31/87) Initial Investigation

Total Expenditures ERM-West and Subcontractors	$26,157.15

Phase 2 -- (1/31/87 to 4/30/87) Mitigation Report

Total Expenditures ERM-West and Subcontractors	$21,598.68

Phase 3 -- (5/1/87 to 6/30/87) Health and Safety Plan

ERM-West and ERM, Inc.	$ 9,000.00

Phase 4 -- (4/15/87 to 6/4/87) Initial work in Armstrong/ Hawes area to pump and store creosote waste.

A. Total Expenditures

Contractor Labor	3,455.33
Contractor Equipment	4,364.71
Materials	14,014.49
Rentals	2,540.16
TOTAL	24,374.69

B. Detailed Costs (specified key tasks/items)

Fenced waste storage and tank area	3,682.00
Baker Tanks	1,902.00
Drain Rock	1,092.66
Grundfuss Pumps	1,699.74
Pump wiring and materials	2,836.25
Visquine	130.92
	11,343.57

Phase 5 -- (7/14/87 to 10/9/87) Continued creosote pumping, monitoring and excavation of contaminated soil, preparation of new lined and bermed soil storage area at GPS site.

A. Total Expenditures

Contractor Labor	11,780.30
Contractor Equipment	13,905.80
Materials	22,085.76
Rentals	5,443.20
TOTAL	53,215.06

TABLE 1 (continued)

B. Detailed Costs (specific key tasks/items)

Debris Sorting/Removal labor	9,126.09
Debris Sorting Equipment	4,345.85
Lined GPS soil storage area	
a) labor	1,798.43
b) equipment	2,162.00
c) visquine	325.68
Baker Tanks	3,678.00
HNu photoionizer	5,544.46
Foxboro OVA	7,438.96
Standby Respirators	138.66
	34,558.13

Phase 6 -- (10/10/87 to 12/14/87) Manifesting liquid creosote waste for disposal, completion of new bermed storage area at GPS, moving soil from Armstrong to GPS, continued creosote pumping and excavation of contaminated soil.

A. Total Expenditures

Contractor Labor	6,452.78
Contractor Equipment	11,254.48
Materials	2,678.86
Rentals	25,059.62
Subcontractor (North American Env.)	29,624.70
TOTAL	75,070.44

B. Detailed Costs (specific key tasks/items)

Moving contaminated soil to GPS site	
a) labor	924.38
b) equipment	3,693.80
c) trucking	1,514.10
d) visquine	1,656.40
e) sand/trucking	4,371.84
Baker Tanks	903.00
Pump/hose rentals	16,692.48
Manifested disposal of liquid waste creosote	29,624.70
	59,380.70

TABLE 1 (continued)

<u>Phase 7</u> -- (12/15/87 to 8/5/88) Continued excavation of contaminated soil, soil classification, removal of metal and debris from contaminated soil, manifested disposal of soil classified as hazardous, submittal and payment of subcontractor invoices.

A. Total Expenditures

Contractor Labor ----------------------------------	6,634.08
Contractor Equipment ----------------------------	16,224.20
Materials --	860.15
Rentals --	3,960.56
Subcontractors ------------------------------------	184,253.13
TOTAL	211,932.12

B. Detailed Costs (specific key tasks/items)

Metal/debris disposal ----------------------------	3,960.56
Crosby & Overton manifested soil disposal) ---	35,532.00
ERM-West ---	58,177.12
EPA Form 5700-41 (ERM-West) ------------------	6,254.85
Anlab --	56,610.17
	160,534.70

TOTAL CHARGES ON C.O. #4 Mitigation Work ---------- $364,592.31

Above information supplied by Industrial Waste Division

WORKER SAFETY

Air in the excavation was monitored to protect workers. Draeger tubes were used to monitor for vinyl chloride near Thomas and Hawes. The remainder of the trenches were checked with an OVA (flame ionization detector) for airborne organic compounds. A high reading was detected in only one sampling. This was found on Hawes near Armstrong on a Friday afternoon. Construction was halted in this area until the following Monday when the air had cleared.

RESULTS AND CONCLUSIONS

The requirements of the Maher Ordinance were met. Worker safety in the deep trenches was maintained (inhalation of toxic compounds prevented). Contaminated soils and groundwater from city property were cleaned and the contaminants were safely treated and disposed of. Contamination within adjoining private properties remains.

Work areas were monitored for airborne gases which would have been hazardous to workers.

The City and County of San Francisco should consider providing a treatment, storage, and disposal facility (TSD) for treating; storage, and/or disposal of potentially hazardous wastes. Treatment of potentially hazardous wastes to reduce the volume and the strength of the waste can result in substantial disposal cost savings. Additionally, the long term liability of disposal at a hazardous waste site can be extremely costly.

APPENDIX A

CITY OF SAN FRANCISCO
SOIL INVESTIGATION REPORT

City of San Francisco
Soil Investigation Report

Prepared by

ERM-West

January 1987

ERM-West
Environmental Resources Management

1777 Botelho Drive · Suite 260 · Walnut Creek, California 94596-5022 ☎ (415) 946-0455
4630 Campus Drive · Suite 200 · Newport Beach, California 92660-1805 ☎ (714) 852-9490
2865 Sunrise Boulevard · Suite 105 · Rancho Cordova, California 95670-6538 ☎ (916) 635-7766

Reply To:

January 16, 1987 Rancho Cordova

Mr. Steve Medberry
Division Engineer
Industrial Waste Division
750 Phelps Street
San Francisco, Ca 94124

Subject: Yosemite and Fitch Outfalls Consolidation Project: Soil Investigation Along the Route of Proposed Sewer Construction.

Dear Steve:

Enclosed are the results of the soil investigation for the subject project. Potential contamination of both soil and water has been found in various portions of the proposed sewer alignment. In the following paragraphs we will provide the background, a summary of the soil collection and analysis methodology, and recommendations for your review and consideration.

Background

In Attachment A is a letter, dated November 3, 1986, from ERM-West to the City of San Francisco, Department of Public Works, that summarizes the proposed workplan and describes the site history, analysis procedure and protocol. The soil investigation proceeded in accordance with the workplan with few exceptions. In some shallow, preliminary borings sampling with an organic vapor analyzer indicated the presents of organics and the borings were drilled deeper and samples were taken for analysis.

Soil Sampling and Analysis

ERM-West managed the project and provided environmental scientists to perform the soil sampling and logging of the borings. The driller for the project was Kleinfelder and Associates, Stockton, California. The laboratory performing the analysis was Anlab, Sacramento, California.

Soil sampling and analysis were conducted in accordance with the San Francisco Municipal Code, Chapter 10, Article 20 (Soils Analysis Code). Borings were made with a hollow stem auger and samples were taken, as required, with a 2-inch California Modified Sampler, shelby tubes, or from the drill cuttings. Samples in most cases were taken ahead of the auger in undisturbed soil.

Laboratory analysis were conducted for the following constituents:

1. Inorganic Toxic Substances (priority pollutant metals; reference EPA Test Methods for Evaluating Solid Wastes, second edition, SW-846, July 1982)

2. Volatile Organic Toxic Pollutants (Purgeable Halocarbons, EPA #8010; Purgeable Aromatics, EPA #8020)

3. Total Petroleum Hydrocarbons (EPA #8015, modified)

4. PCBs (EPA #8080)

5. pH (EPA #9040)

6. Flammability (EPA #1010)

7. Cyanides (EPA #9010)

8. Sulfides (EPA #9030)

Results of Soil Analysis

The results of the soil investigation are summarized in Table 1 for the compounds that exceed State and Federal Regulations. The complete laboratory reports for each of the borings and the samples analyzed are provided in Attachment B. Boring numbers identified in Table 1 correspond to the boring locations shown on Figure 1.

Title 22, California Administrative Code, and the Department of Health Services, Action Level Table were used as regulatory standards to compare the results of the samples for identifying whether the sample can be classified as a hazardous waste. For the metals and some of the organic compounds, Title 22 establishes the limits for hazardous waste classifications. For the purgeable organic compounds, no limits are provided by Title 22, therefore the "action levels" established by the Department of Health Services was used for comparison.

Of the 26 borings drilled, 11 boring locations indicate the presence of chemical compounds that are in sufficient concentration to potentially classify the material as hazardous waste or in excess of the action levels established by DOHS. The results of the soil investigation are from a limited number of borings along the alignment of the proposed sewer, and that the evidence of potential contamination in any one sample is for that boring location only. The extent of the potential contamination cannot be determined, nor the level of cleanup, if required, cannot be determined without further detail investigation of ground water flow, local geology, future use of the area, with respect to both land and water, and without the full concurrence of the regulatory agencies and the City of San Francisco.

The borings, where contamination was found to exceed the above referenced regulatory standards, can be grouped into four areas within the proposed sewer alignment: Area 1 - Hawes St. between Thomas and Van Dyke Avenues (borings 2, 3, 4, and 5); Area 2 - Hawes St. and Armstrong Ave (borings "I", 7 and 8); Area 3 - Ingalls St. and Armstrong Ave (boring "G", "O", 9, and 10); and Area 4 - Bancroft Ave. straddling Griffith St. (borings 11 and 12).

Area 1 - Borings 1, 2, 3, 4, and 5. In this area, high metal concentrations (copper, lead, and nickel), that exceed Title 22 limits, were found in several soil samples. The area is underlain with a fractured rock formation that prevented drilling deeper than 30 feet. In borings 1, 2, and 3, drilling stopped at depths ranging from 15 to 30 feet; ground water was not encountered in these borings.

Some detectable concentrations of purgeable organics (PCE, TCE, Chloroform, and 1,2 Dichloroethane) were found in the soil of these borings. With these levels of purgeable organics in the soil it is possible that these compounds may be found in the ground water in the area and in concentrations that exceed regulatory requirements.

Detectable levels of cyanide were also evident in samples from borings 2 and 4. The origin of this compound is unknown.

Area 2 - Borings "I", 7, 7A, and 8. In these borings, the samples indicated metals contamination (copper, zinc, lead, and mercury) in the soil and ground water contaminated with purgeable aromatics (benzene, touluene, etc.). In boring 7, a black, aromatic product was found floating on the ground water. The float smelled like tar and was thought to be creoste or some derivative of fence treatment, since the boring is located near the site of a former lumber yard. Subsequent testing of the soil from borings 7 and 8 indicated no evidence of creosote and pentachlorophenol above a detection limit of 10 mg/kg; however, significant levels of benzene, toluene, and xylene (BTX) were detected in the groundwater.

The water sample from boring 7A was analyzed and found to contain significant levels of creosote derivatives. The concentration levels of the chemicals are shown in Table 1.

Area 3 - Boring "G", "O", 9, and 10. Evidence of purgeable aromatic contamination (benzene, touluene, etc.) was found in the ground water. A leaking diesel fuel tank to the north of Ingalls St. may be the origin of the contamination. It appears that the contamination may be following the porous backfill of a sewer in the center of Ingalls St.

Detectable levels of cyanide were found in a soil sample from boring 10. As with Area 1, the origin of this compound is unknown.

Area 4 - Borings 11 and 12. Lead and nickel levels in soil samples were detected in excess of Title 22 standards. The concentrations did not exceed the TTLC limits; however, the concentrations noted in Table 1 exceed ten times the STLC limits.

Recommendations

1. Since the soil investigation included an exploration of only a small portion of the overall sewer excavation area, and potential contamination of the soil and water were found, the construction project should proceed with care, with the awareness that potential contaminated soil and water may be encountered between the boring areas where no contamination was found.

2. Contingency plans should be developed and initiated for the time when contaminated soil or water is encountered during the construction of the sewer.

3. The excavated soil from the sewer trench should be visually inspected as the project progresses for signs of contamination. A volatile organic analyzer should be on-site, used, and maintained throughout the excavation portion of the project.

4. By areas, the specific recommendations aside from the general ones noted above, are as follows:

   Area 1 - Few metal concentrations were found that potentially exceed STLC limits; therefore, construction may proceed in this area. However, purgeable organics were uncovered in the soil, and ground water was not encountered. The potential for PCE, TCE, and other contamination is possible. If ground water is encountered in this area, a volatile organic analyzer should be used to test for presence of organics. If readings in excess of 100 are detected, then further sampling and analysis should be performed on the material.

   Area 2 - Construction should not proceed in this area until further investigations are conducted. Specifically, more borings will be drilled to determine the extent of the groundwater contamination by creosote around boring 7A (adjacent to boring 7). The fuel contamination around boring I is not significant enough to warrant cleanup. An additional boring will be made to verify level.

Area 3 - Construction may proceed in this area since total hydrocarbons are less than 10 mg/l.

Area 4 - Few metal concentrations were found that potentially exceed STLC limits; therefore, construction may proceed in this area.

5. If contaminated water is encountered in the excavation in any area, the potential for the sewer to act as a conduit for the contamination is great. Barriers across the sewer alignment should be constructed to stem the potential for contaminant transport through the sewer backfill. As a minimum barriers should be considered between areas 1 and 2, 2 and 4, and between boring locations "O" and 9.

6. If contaminated soils in the water bearing strata are removed from area 2, 5,700 cubic yards would require disposal at a class 1 disposal site. These estimated volumes of contaminated soil is assumed removed from the trenching operation only and does not include soil outside the excavation. Contaminated ground water would require approved treatment and disposal.

Please call if you have any questions or require further discussion or interpretation of the results.

Very truly yours,

ERM-West

Dennis Miller for

Daniel Hinrichs
Principal Engineer

DM/204

Enclosure - Noted

cc: Melita Elmore
    Dennis Miller

TABLE 1

BORINGS WHERE SPECIFIC COMPOUNDS EXCEEDED
REGULATORY STANDARDS OR ACTION LEVELS

CONSTITUENT	Boring Number											REGULATORY STANDARD (1) or ACTION LIMIT	
	B2	B4	B5	B7	B7A	B8	B10	B11	B12	B"O"	B1	STLC (mg/l)	TTLC (mg/kg)
Antimony, mg/kg												15.0	500
Arsenic, mg/kg												5.0	500
Beryllium, mg/kg												0.75	75
Cadmium, mg/kg												1.0	100
Chromium, mg/kg												5.0	500
Copper, mg/kg		1400**		440								25.0	2,500
Lead, mg/kg			120**	230				76	740*			5.0	1000
Mercury, mg/kg						.039						0.2	20
Nickel, mg/kg		1900**						1400				20.0	2,000
Silver, mg/kg												5.0	500
Thallium, mg/kg												7.0	700
Zinc, mg/kg				7400								250	5,000
Trichloroethlene, mg/kg												204	2,040
PCB's												5.0	50
Flammability													
Cyanide, mg/kg	4.8	2.7					4.0						
Sulfide, mg/kg													
Total Petroleum Hydrocarbons, mg/l					680					7	36	10 mg/l	
Benzene, mg/l					0.8					1.2	1.7	0.0007 mg/l	
Toluene, mg/l					0.14					2.3	0.87	0.10 mg/l	
Ethylbenzene, mg/l					1.0					0.73	0.14	-	
Xylenes, mg/l					1.2					1.0	0.09	0.62 mg/l	
1,1-Dichloroethylene, mg/l					0.2					0.17	0.18	0.0001 - .0004 mg/l	

TABLE 1 - Continued

BORINGS WHERE SPECIFIC COMPOUNDS EXCEEDED
REGULATORY STANDARDS OR ACTION LEVELS

CONSTITUENT	Boring Number											REGULATORY STANDARD (1) or ACTION LIMIT	
	B2	B4	B5	B7	B7A	B8	B10	B11	B12	B"O"	B1	STLC (mg/l)	TTLC (mg/kg)
Creosote Components													
Acenaphthylene					0.19 mg/l								
Anthracene					1.6 mg/l								
Chrysene					0.36 mg/l								
Fluoranthene					1.3 mg/l								
Fluorene					0.38 mg/l								
Napthalene					2.7 mg/l								
Phenanthrene					0.82 mg/l								
Pyrene					1.0 mg/l								

(1) Soluble Threshold Limit Concentration (STLC)
Total Threshold Limit Concentration (TTLC)
STLC and TTLC values from California Administrative Code, Title 22, Section 66699,
Title 22, Section 66699, Adopted January 12, 1985

* Indicates average of 3 samples

** Indicates one depth only

ATTACHMENT A

ERM-West
Environmental Resources Management

1777 Botelho Drive • Suite 260 • Walnut Creek, California 94596-5022 ☎ (415) 946-0455
4630 Campus Drive • Suite 200 • Newport Beach, California 92660-1805 ☎ (714) 852-9490
2865 Sunrise Boulevard • Suite 105 • Rancho Cordova, California 95670-6538 ☎ (916) 635-7766

Reply To:

November 3, 1986

Rancho Cordova

Mr. Steve Medberry
Division Engineer
Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

SUBJECT: Hazardous Waste Investigation Yosemite and Fitch Outfalls Consolidation

Dear Steve:

The City and County of San Francisco, Department of Public Works propose to construct transport/storage facilities for industrial waste lines. This project will reduce overflows and will transport wet and dry weather flows to a treatment plant. The proposed project consists of a 16 block area surrounding the Fitch Street, Griffith Street and Yosemite Avenue outfalls, and is located in a heavily industrialized area.

Prior to construction, a hazardous waste investigation will be conducted. Based on records search of the area by Norman Grib, the industries present were of the type that we would expect the presence of inorganics, fuels, oils, other organics, and heavy metals. We will initially take preliminary samples - the approximate sample locations are shown on the map as circles - and check those borings with an organic vapor analyzer. If positive results are found, soil samples will be taken for further analyses. Soil and/or groundwater samples will also be taken for laboratory testing at those locations represented on the map with triangles and numbered 1 through 12.

Laboratory analyses to be conducted include:

1. Inorganic Toxic Substances
2. Volatile Organic Toxic Pollutants
3. PCBs
4. pH
5. Flammability
6. Cyanides
7. Sulfides
8. Methane and other flammable gases

These are the constituents required to be analyzed by the San Francisco Municipal Code, Chapter 10, Article 20 (Soils Analyses Code). Additionally, we recommend that Samples No. 7 and 8 are also analyzed for cresote, pentachlorophenol, and phenol. These sample points are located by lumber yards where wood may have been treated with a preservative.

Composite soil samples will be tested. Individual samples will be preserved in the event that more information is needed or contamination is found. Holes will be drilled to the bottom of the proposed excavation (varies to a maximum of 32 feet) or to the top of the bay mud layer. We may also drill through the bay mud in several locations if further investigations reveal that neighboring industries produce(d) chemicals that may permeate bay muds. Mr. Grib is to provide a list of the possible chemicals present from the nearby businesses.

If all results are less than allowable limits as noted in the Soil Analyses Code, then a report will be prepared stating these results. If limits are exceeded, additional testing will be done. The extent of the testing will depend on original results and location of problem(s). A determination will also be required as to the means of cleanup. All sampling and analyses will be conducted according to approved methodology as stated in the Soils Analyses Code.

The result of the proposed sampling program is, in my judgment, representative of the proposed excavation site conditions. Upon completion of this work and review of the results, I will repeat the above statement except the word proposed will be deleted.

If you have any questions, please call me.

Sincerely yours,

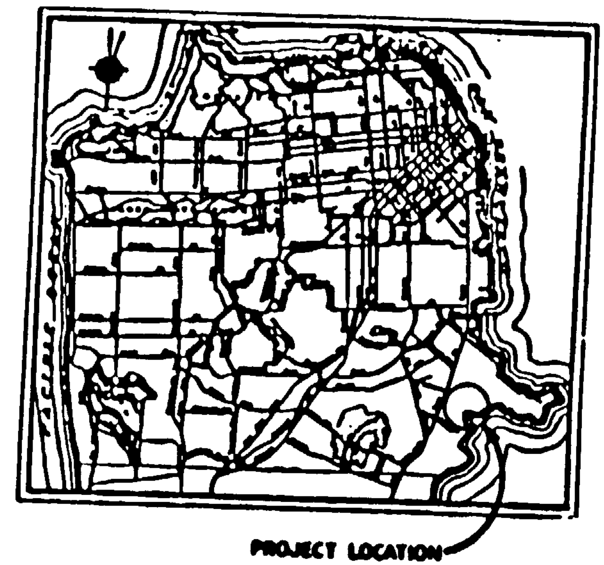
ERM-West

Melita Elmore (for)

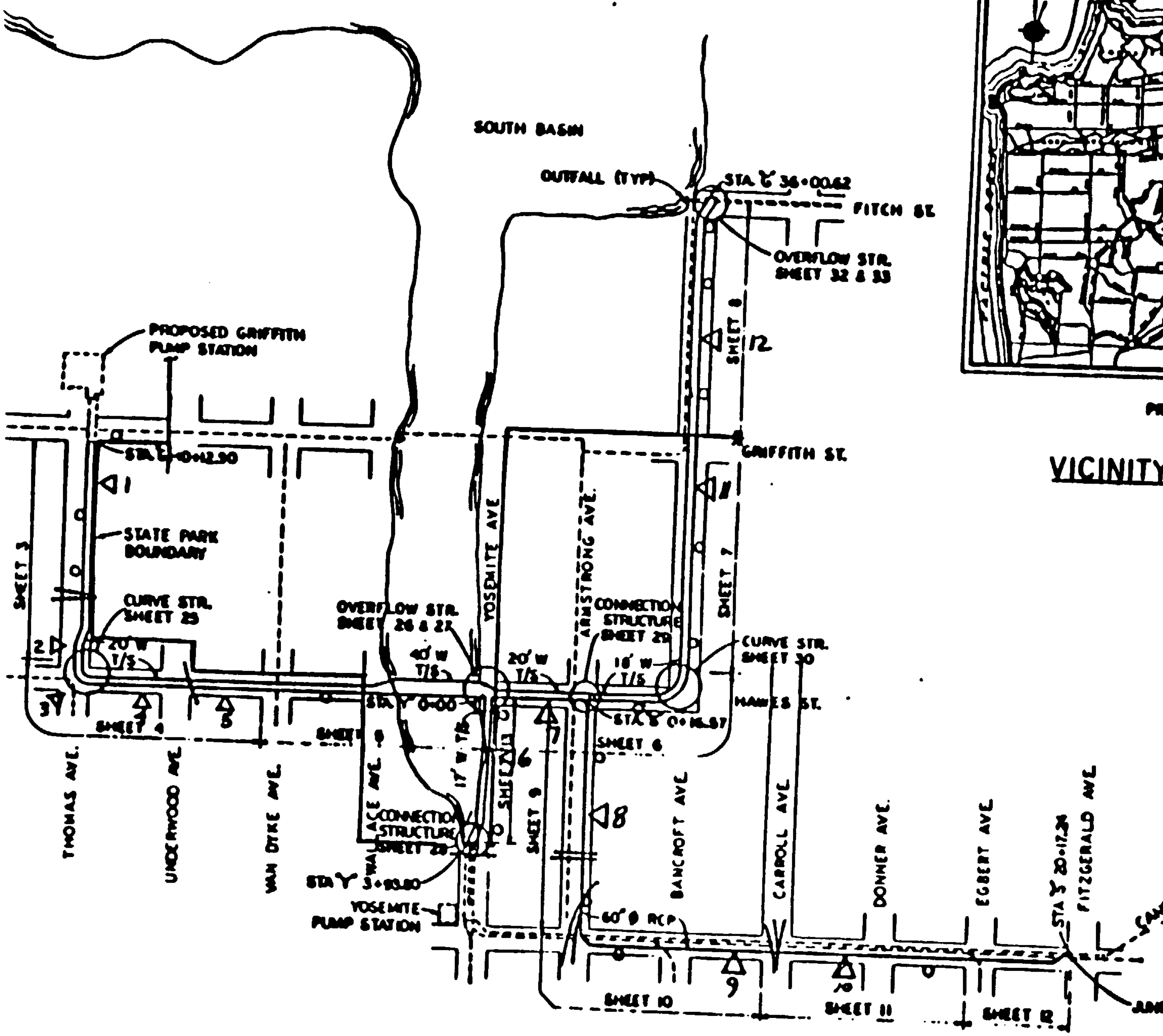
Daniel Hinrichs
Principal Engineer

DH/lal/192

cc: Norman Grib
Tom Ikesaki
Melita Elmore



VICINITY MAP



LOCATION MAP

ATTACHMENT B

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 24, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111359

ERM-WEST
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Attn: Dan Hinrichs

Project ~~#192~~ 204

DESCRIPTION ANLAB ID#	CRESOTE EPA #8270-FID	PENTACHLOROPHENOL EPA #8040-FID
Boring 7 111265-15,16	<10 mg/kg	<10 mg/kg
Boring 8 111311-8,9	<10 mg/kg	<10 mg/kg
Boring "O" 111359-13	<1 mg/l	<1 mg/l

Data Certified by [signature]

Report Approved by [signature]

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Dan Hinrichs
ERM-WEST
Rancho Cordova

Project: 204

DESCRIPTION/ ANLAB ID NO.	pH	Total Cyanide mg/1	Sulfide mg/kg	Flammability* °F **	PCB* Arochlors mg/kg
Boring #1 5-12-5' cutting composite 111235-1	8.9	<0.2	<0.1	>150°F	<0.1
Boring #2 10-22-5 cutting composite 111235-2	8.4	4.8	<0.1	>150°F	<0.1
Boring #3 composite of 3 Borings 111235-4,5,6	8.2	<0.2	<0.1	>150°F	<0.1
Boring #4 composite of 3 Borings 111235-9,10,11	7.6	2.7	<0.1	>150°F	<0.1
Boring #5 composite of 3 Borings 111235-13,14,15	7.8	<0.2	<0.1	>150°F	<0.1

*These were run individually values are average of the three.

**Based on values of flammability -Methane was not performed.

Data Certified by [signature]

Report Approved by [signature]

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 22, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204

DESCRIPTION ANALB ID#	pH	TOTAL CYANIDE mg/kg	SULFIDE mg/kg	FLAMMABILITY °F	PCB ARCHLORS mg/kg
Boring #6 111265-14	8.3	<0.2	<0.1	>150	<0.1
Boring #7 111265-15,16	8.2	<0.2	<0.1	>150	<0.1
Boring #8 111311-8,9	8.1	<0.2	<0.1	>150	<0.1
Boring #9 111265-1,2	7.4	<0.2	<0.1	>150	<0.1
Boring #10 111265-5,6,7	7.6	4.0	<0.1	>150	<0.1
Boring #11 111311-13,14,15	7.9	<0.2	<0.1	>150	<0.1
Boring #12 111311-1,2,3	8.0	<0.2	<0.1	>150	<0.1

Data Certified by [signature]

Report Approved by rae

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET SACRAMENTO CALIFORNIA 95814 • 916-447-2946

Dan Hinrichs
ERM-WEST
Rancho Cordova

Project: 204

DESCRIPTION ANLAB ID NO.	Be mg/kg	Cd mg/kg	Cr mg/kg	Cu mg/kg	Pb mg/kg	Ni mg/kg	Ag mg/kg	Zn mg/kg
Boring #1 5-12-5 Cutting Composite 111235-1	0.6	0.4	40	18	15	42	1.0	58
Boring #2 10-22-5 cutting composite 111235-2	0.6	0.6	70	21	16	47	1.2	60
Boring #3* Composite of 3 Borings 111235-4,5,6	0.5	2.0	52	18	16	55	0.8	44
Boring #4* Composite of 3 Borings 111235-9,10,11	0.3	<0.2	48	720	16	970	0.4	480
Boring #5* Composite of 3 Borings 111235-13,14,15	0.3	0.2	64	160	70	50	0.4	530

*These were analyzed individually and are listed in attachment. These are averages of three samples.

Data Certified by

Report Approved by

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET SACRAMENTO CALIFORNIA 95814 • 916-447-2946

Dan Hinrichs
ERM-WEST
Rancho Cordova

Project: 204

DESCRIPTION ANLAB ID NO.	Sb mg/kg	As mg/kg	Se mg/kg	Tl mg/kg	Hg mg/kg
Boring #1 -12-5 Cutting Composite .1235-1	<0.2	18	<0.1	<0.04	0.20
Boring #2 -22-5 Cutting Composite 1235-2	<0.2	18	<0.1	0.02	0.05
ring #3 mposite of Borings 1235-4,5,6	<0.2	20	<0.1	0.03	0.05
ing #4* mposite of Borings 1235-9,10,11	<0.2	2.7	<0.1	0.02	0.05
ing #5* posite of Borings 235-13,14-15	<0.2	9.1	<0.1	0.02	0.08

ese were analyzed individually and are listed in attachment. These are averages of three
ples.

Data Certified by [signature]

Report Approved by [signature]

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO CALIFORNIA 95814 • 916-447-2946

December 23, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204

DESCRIPTION/ ANLAB ID#		Be mg/kg	Cd mg/kg	Cr mg/kg	C~~d~~u mg/kg	Pb mg/kg	Ni mg/kg	Ag mg/kg	Zn mg/kg	Sb mg/kg
Boring #6 111265-14		0.4	0.4	44	19	11	49	0.4	44	<0.2
Boring #7 111265-15,16	2	0.4	0.7	50	94	76	46	0.6	180	<0.2
Boring #8 111311-8,9		0.3	0.2	35	64	13	28	0.4	35	<0.2
Boring #9 111265-1,2	3	0.2	<0.2	94	18	11	50	0.5	37	<0.2
Boring #10 111265-5,6,7		0.3	0.2	57	12	13	45	0.3	30	<0.2
Boring #11 111311-13,14,15	4	0.4	0.2	320	29	30	490	0.3	72	<0.2
Boring #12 111311-1,2,3		0.2	1.8	46	62	740	41	1.7	390	<0.2

Data Certified by [signature]

Report Approved by [signature]

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET SACRAMENTO CALIFORNIA 95814 • 916-447-2946

January 12, 1987
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235 (Addendum)

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204

DESCRIPTION ANLAB ID#		As mg/kg	Se mg/kg	Tl mg/kg	Hg mg/kg
Boring #6 111265-14		13	<0.1	0.06	0.012
Boring #7 111265-15,16	- 2	9.7	<0.1	0.05	0.020
Boring #8 111311-8,9		5	<0.1	0.03	0.039
Boring #9 111265-1,2	3	8.7	<0.1	0.03	0.054
Boring #10 111265-5,6,7		7.3	<0.1	0.03	0.037
Boring #11 111311-13,14,15	4	4	<0.1	0.03	0.071
Boring #12 11311-1,2,3		6	<0.1	0.05	0.67

Data Certified by [signature]

Report Approved by Roger Elliott

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL
1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 22, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204 - Individual Analysis

	Boring 1	Boring 2		Boring 3			Boring
	B1	B2	BA	B3	B3	B3	B9
ANALYSIS	111235-1	111235-2	111235-3	111235-4	111235-5	111235-6	111235-
METALS:							
Beryllium, mg/kg	0.6	0.6	0.6	0.4	0.6	0.6	<0.2
Cadmium, mg/kg	0.4	0.6	0.6	0.4	3.6	0.4	<0.2
Chromium, mg/kg	40	70	39	50	31	63	35
Copper, mg/kg	18	21	21	15	20	21	14
Lead, mg/kg	15	16	20	15	15	16	22
Nickel, mg/kg	42	47	49	42	41	77	1900
Silver, mg/kg	1.0	1.2	1.2	0.6	1.0	1.0	0.6
Zinc, mg/kg	58	60	61	38	48	52	55
Antimony, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic, mg/kg	18	18	21	13	25	17	0.4[illegible]
Selenium, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thallium, mg/kg	0.04	0.02	0.02	0.04	0.04	0.2	<0.0[illegible]
Mercury, mg/kg	0.20	0.053	0.044	0.060	0.065	0.032	0.0[illegible]

Data Certified by ___

Report Approved by ___

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 22, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204 - Individual Analysis

	Boring 4			Boring 5		
	B4	B4	B4	B5	B5	B5
ANALYSIS	111235-10	111235-11	111235-12	111235-13	111235-14	11123[illegible]
METALS:						
Beryllium, mg/kg	0.2	0.4	0.4	0.4	0.2	0.4
Cadmium, mg/kg	<0.2	<0.2	3.0	<0.2	0.4	<0.2
Chromium, mg/kg	27	65	53	19	120	36
Copper, mg/kg	1400	58	49	25	610	18
Lead, mg/kg	8	9	13	25	120	12
Nickel, mg/kg	24	62	58	44	13	55
Silver, mg/kg	<0.2	0.2	0.2	0.8	0.6	<0.2
Zinc, mg/kg	950	32	45	52	1000	42
Antimony, mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Arsenic, mg/kg	2.8	8	11	8.4	9.6	10
Selenium, mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Thallium, mg/kg	0.02	0.02	0.04	0.04	<0.02	<0.0[illegible]
Mercury, mg/kg	0.700	0.035	0.056	0.096	1.7	0.0[illegible]

Data Certified by Y

Report Aproved by Mae

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 22, 1986
Sample Date: 11/11 11/12/86
Sample Rec'd. Date: 11/13/86
Report #111235

ERM-WEST
Dan Hinrichs
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

Project #204 - Individual Analysis

ANALYSIS	Boring 5 B5 111235-15	Boring 5 B5 111235-16	Boring 7 B7 111235-17
METALS:			
Beryllium, mg/kg	0.4	0.2	<0.2
Cadmium, mg/kg	<0.2	<0.2	12
Chromium, mg/kg	36	44	43
Copper, mg/kg	18	6.4	440
Lead, mg/kg	12	6	230
Nickel, mg/kg	55	24	140
Silver, mg/kg	<0.2	0.8	0.80
Zinc, mg/kg	42	17	7400
Antimony, mg/kg	<0.2	<0.2	1.4
Arsenic, mg/kg	10	2.8	24
Selenium, mg/kg	<0.1	<0.1	<0.1
Thallium, mg/kg	<0.02	<0.02	<0.02
Mercury, mg/kg	0.028	0.017	0.023

Data Certified by Y

Report Approved by Rae

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST   Report # 111235   Page

Sample Description: Boring #1   Anlab ID# 111235-1   Units: mg/kg

Date sampled: 11/11 11/12/86   Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylene
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyle
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE)
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed

Data Certified by ___γ___   Report Approved By ___ke___

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111235 | Page

Sample Description: Boring #2 (Soil) | Anlab ID# 111235-2 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	0.16	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

Data Certified by ________ Report Approved By ________

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111235 | Page

Sample Description: Boring #3* | Anlab ID# 111235-4,5,6 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	0.13	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	0.12	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	0.37	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

Data Certified by ____ | Report Approved By ____

*Average of composite. Sample run individually see attached.

ANALYTICAL LABORATORY
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Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111235 | Page

Sample Description: Boring #4* | Anlab ID# 111235-9,10,11 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	0.04	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyle
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE)
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

Data Certified by ________ Report Approved By ________

*Average of 3 samples. Samples run individually.

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST

Report # 111235 Page

Sample Description: Boring #5*

Anlab ID# 111235-13,14,15 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	0.20	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	0.04	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	0.03	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed

Data Certified by ___ Report Approved By ___

*Average of 3 samples.

ANALYTICAL LABORATORY
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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111265 | Page

Sample Description: Boring #6 | Anlab ID# 111265-14 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed

Data Certified by ______ Report Approved By ______

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST   Report # 111265   Page

Sample Description: Boring #9   Anlab ID# 111265-1,2*   Units: mg/kg

Date sampled: 11/11 11/12/86   Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylene
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyle
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	0.38	(AKA: Tetrachloroethylene, PCE)
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED   CONCENTRATION

n/a = not analyzed

Data Certified by J   Report Approved By he

*Composite

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111265 | Page

Sample Description: Boring #10 | Anlab ID# 111265-5,6,7 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

Data Certified by ____ | Report Approved By ____

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST | Report # 111311 | Page
Sample Description: Boring #11 | Anlab ID# 111311-13,14,15 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylene
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyle
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

Data Certified by ____ Report Approved By ____

Composite

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST

Report # 111311 Page

Sample Description: Boring #12

Anlab ID# 111311-1,2,3,4 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	0.26	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED CONCENTRATION

n/a = not analyzed

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Report Approved By ____________

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Purgable Halocarbons
EPA #8010

Client: ERM-WEST

Report # 111311 Page

Sample Description: Boring I

Anlab ID# 111311-10,11,12 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED CONCENTRATION

n/a = not analyzed

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #8010

Client: ERM-WEST

Report # 111359-11

Page

Sample Description: Boring O

Anlab ID# 111359-11

Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.05	(AKA:Dichlorobromomethane)
Bromoform	<0.05	
Bromomethane	<0.05	
Carbon tetrachloride	<0.05	
Chlorobenzene	<0.05	
Chloroethane	<0.05	
2-Chloroethylvinyl ether	<0.1	
Chloroform	<0.05	
Chloromethane	<0.05	
Dibromochloromethane	<0.05	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.05	
1,3-Dichlorobenzene	<0.05	
1,4-Dichlorobenzene	<0.05	
Dichlorodifluoromethane	<0.15	
1,1-Dichloroethane	<0.05	
1,2-Dichloroethane	<0.05	
1,1-Dichloroethene	<0.02	
1,2-Dichloroethene	<0.05	(AKA: trans-1,2-Dichloroethyle
1,2-Dichloropropane	<0.05	
1,3-Dichloropropene	<0.05	(AKA: cis-1,3-Dichloropropylen
1,3-Dichloropropene	<0.05	(AKA: trans-1,3-Dichloropropyl
Methylene chloride	<0.05	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.05	
Tetrachloroethene	<0.05	(AKA: Tetrachloroethylene, PCE
1,1,1-Trichloroethane	<0.05	
1,1,2-Trichloroethane	<0.05	
Trichloroethene	<0.05	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.05	
Vinyl Chloride	<0.01	

OTHER COMPOUNDS DETECTED OR REQUESTED CONCENTRATION

n/a = not analyzed

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #601

Client: ERM-WEST

Report # 111265

Page

Sample Description: Boring 7A

Anlab ID# 111265-29

Units: ug/l

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.5	(AKA:Dichlorobromomethane)
Bromoform	<0.5	
Bromomethane	<0.5	
Carbon tetrachloride	<0.5	
Chlorobenzene	<0.5	
Chloroethane	<0.5	
2-Chloroethylvinyl ether	<1	
Chloroform	<0.5	
Chloromethane	<0.5	
Dibromochloromethane	<0.5	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.5	
1,3-Dichlorobenzene	<0.5	
1,4-Dichlorobenzene	<0.5	
Dichlorodifluoromethane	<1.5	
1,1-Dichloroethane	<0.5	
1,2-Dichloroethane	<0.5	
1,1-Dichloroethene	170	
1,2-Dichloroethene	<0.5	(AKA: trans-1,2-Dichloroethyler
1,2-Dichloropropane	<0.5	
1,3-Dichloropropene	<0.5	(AKA: cis-1,3-Dichloropropylene
1,3-Dichloropropene	<0.5	(AKA: trans-1,3-Dichloropropyle
Methylene chloride	<0.5	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.5	
Tetrachloroethene	<0.5	(AKA: Tetrachloroethylene, PCE)
1,1,1-Trichloroethane	<0.5	
1,1,2-Trichloroethane	<0.5	
Trichloroethene	<0.5	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.5	
Vinyl Chloride	<0.1	

OTHER COMPOUNDS DETECTED OR REQUESTED — CONCENTRATION

n/a = not analyzed

Data Certified by J

Report Approved By Re

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #601

Client: ERM-WEST | Report # 111359 | Page

Sample Description: Boring O | Anlab ID# 111359-15 | Units: ug/1

Date sampled: 11/11 11/12/86   Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.5	(AKA:Dichlorobromomethane)
Bromoform	<0.5	
Bromomethane	<0.5	
Carbon tetrachloride	<0.5	
Chlorobenzene	<0.5	
Chloroethane	<0.5	
2-Chloroethylvinyl ether	<1	
Chloroform	<0.5	
Chloromethane	<0.5	
Dibromochloromethane	<0.5	(AKA: Chlorodibromomethane)
1,2-Dichlorobenzene	<0.5	
1,3-Dichlorobenzene	<0.5	
1,4-Dichlorobenzene	<0.5	
Dichlorodifluoromethane	<1.5	
1,1-Dichloroethane	<0.5	
1,2-Dichloroethane	<0.5	
1,1-Dichloroethene	200	
1,2-Dichloroethene	<0.5	(AKA: trans-1,2-Dichloroethylene
1,2-Dichloropropane	<0.5	
1,3-Dichloropropene	<0.5	(AKA: cis-1,3-Dichloropropylene)
1,3-Dichloropropene	<0.5	(AKA: trans-1,3-Dichloropropylen
Methylene chloride	<0.5	(AKA: Dichloromethane)
1,1,2,2,-Tetrachloroethane	<0.5	
Tetrachloroethene	<0.5	(AKA: Tetrachloroethylene, PCE)
1,1,1-Trichloroethane	<0.5	
1,1,2-Trichloroethane	<0.5	
Trichloroethene	<0.5	(AKA: Trichloroethylene, TCE)
Trichlorofluoromethane	<0.5	
Vinyl Chloride	<0.1	

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Halocarbons
EPA #601

Client: ERM-WEST

Report # 111311 Page

Sample Description: Boring I

Anlab ID# 111311-23 Units: ug/1

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION	
Bromodichloromethane	<0.5	(AKA:Dichlorobromomethane)
Bromoform	<0.5	
Bromomethane	<0.5	
Carbon tetrachloride	<0.5	
Chlorobenzene	<0.5	
Chloroethane	<0.5	
2-Chloroethylvinyl ether	<1	
Chloroform	<0.5	
Chloromethane	<0.5	
Dibromochloromethane	<0.5	(AKA: Chlorodibromomethane)
,2-Dichlorobenzene	<0.5	
,3-Dichlorobenzene	<0.5	
,4-Dichlorobenzene	<0.5	
ichlorodifluoromethane	<1.5	
,1-Dichloroethane	<0.5	
,2-Dichloroethane	<0.5	
,1-Dichloroethene	180	
,2-Dichloroethene	<0.5	(AKA: trans-1,2-Dichloroethylen
,2-Dichloropropane	<0.5	
,3-Dichloropropene	<0.5	(AKA: cis-1,3-Dichloropropylene
,3-Dichloropropene	<0.5	(AKA: trans-1,3-Dichloropropyle
ethylene chloride	<0.5	(AKA: Dichloromethane)
,1,2,2,-Tetrachloroethane	<0.5	
etrachloroethene	<0.5	(AKA: Tetrachloroethylene, PCE)
1,1-Trichloroethane	<0.5	
1,2-Trichloroethane	<0.5	
ichloroethene	<0.5	(AKA: Trichloroethylene, TCE)
ichlorofluoromethane	<0.5	
nyl Chloride	<0.1	

HER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

'a = not analyzed

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST | Report #:111235 | Page

Sample Description: Boring 1 | Anlab ID #:111235-1 | Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.12
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methyl Ethyl Ketone	0.2

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ___ Report Approved by ___

ANALYTICAL LABORATORY
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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring 2

Anlab ID #: 111235-2 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.1
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methyl Ethyl Ketone	0.1

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ________ Report Approved by ________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring #3

Anlab ID #: 111235-4, Units: mg/kg
111235-5

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.18
Chlorobenzene	0.09
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	0.11
Ethylbenzene	0.15
Toluene	0.1
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methyl Ethyl Ketone	0.2

n/a = not analyzed
n/d = none detected as specified in the EPA method

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ANALYTICAL LABORATORY
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Purgable Aromatics
EPA #8020

Client: ERM-WEST   Report #:111235   Page

Sample Description: Boring #3   Anlab ID #:111235-5   Units: mg/kg

Date sampled: 11/11 11/12/86   Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.21
Chlorobenzene	0.19
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	0.22
Ethylbenzene	0.29
Toluene	0.2
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111235 Page

Sample Description: Boring #4

Anlab ID #:111235-9, Units:mg/kg
10,11

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.1
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.07
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methyl Ethyl Ketone	<0.1

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST Report #: 111235 Page

Sample Description: Boring #4 Anlab ID #:111235-10 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST
Report #:111235 Page

Sample Description: Boring #4
Anlab ID #:111235-11 Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.12
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.21
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methyl Ethyl Ketone	0.1

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111235 Page

Sample Description: Boring #5

Anlab ID #:111235-13,Units:mg/kg
14,15,16

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<.1
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.12
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111311 Page

Sample Description: Boring #8

Anlab ID #: 111311-8,9 Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.33
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ________ Report Approved by ________

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Purgable Aromatics
EPA 8020

Client: ERM-WEST

Report #:111265 Page

Sample Description: Boring #6

Anlab ID #:111265-14 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	1.3
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ________ Report Approved by ________

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111265 Page

Sample Description: Boring #9

Anlab ID #:111265-1,2Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.11
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.89
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ____ Report Approved by ____

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Purgable Aromatics
EPA #8020

Client: ERM-WEST | Report #: 111265 | Page

Sample Description: Boring #10 | Anlab ID #:111265-5, 111265-6 | Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	0.07
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	0.08
Ethylbenzene	<0.05
Toluene	0.60
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET. SACRAMENTO. CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring #11

Anlab ID #:111311-13, Units:mg/kg
14,15

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	3.3
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	1.5
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	1.0
Toluene	0.3
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring #3

Anlab ID #: 111235-4 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.15
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
Methy Ethyl Ketone	0.2

n/a = not analyzed
n/d = none detected as specified in the EPA method

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ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring #4

Anlab ID #: 111235-9 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.1
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ________ Report Approved by ________

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring #5
6-6.5'

Anlab ID #:111235-13 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
thylbenzene	<0.05
oluene	<0.05
ylenes	<0.05

THER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

/a = not analyzed
/d = none detected as specified in the EPA method

ıta Certified by ____ Report Approved by ____

ıis report is applicable only to the sample received by the laboratory. The liability of the laboratory is limited to the amount paid for this report. This report is for the clusive use of the client to whom it is addressed and upon the condition that the client assumes all liability for the further distribution of the report or its contents.

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111235 Page

Sample Description: Boring #5

Anlab ID #:111235-14 Units:mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.1
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.37
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111235 Page

Sample Description: Boring #5
15.5-16

Anlab ID #: 111235-15 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ___ Report Approved by ___

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111235 Page

Sample Description: Boring #5
20.5 - 21.0

Anlab ID #:111235-16 Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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1914 S STREET. SACRAMENTO. CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring #8
5.5-6'

Anlab ID #:111311-8 Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111311 Page

Sample Description: Boring #8
11-11.5'

Anlab ID #: 111311-9 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	0.66
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111265 Page

Sample Description: Boring #10

Anlab ID #:111265-6 Units:mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	0.15
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	0.16
Ethylbenzene	<0.05
Toluene	0.62
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Report Approved by ________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111265 Page

Sample Description: Boring #10
5-5.5'

Anlab ID #:111265-5 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.36
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED | CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Report Approved by ____________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111265 Page

Sample Description: Boring #10
15.5-16.0'

Anlab ID #: 111265-7 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	0.90
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #: 111311 Page

Sample Description: Boring #11
5.5-6

Anlab ID #:111311-13 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Report Approved by ____________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring #11
10-10.5'

Anlab ID #:111311-14 Units: mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring #11
16-16.5'

Anlab ID #:111311-15 Units:mg/kg
Individual

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	10.0
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	4.6
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	2.9
Toluene	1.1
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ___ Report Approved by ___

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A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #602

Client: ERM-WEST

Report #: 111265

Page

Sample Description: Boring #6

Anlab ID #: 111265-14

Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.5
Chlorobenzene	<0.5
1,2 - Dichlorobenzene	<0.5
1,3 - Dichlorobenzene	<0.5
1,4 - Dichlorobenzene	<0.5
Ethylbenzene	<0.5
Toluene	1.3
Xylenes	<0.5

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

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Report Approved by ____________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring I

Anlab ID #:111311-21 Units: mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	1700
Chlorobenzene	<0.05
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	140
Toluene	870
Xylenes	97

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
1,1 Dichloroethylene	180

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ____________

Report Approved by ____________

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Purgable Aromatics
EPA #8020

Client: ERM-WEST

Report #:111311 Page

Sample Description: Boring #12

Anlab ID #:111311-1, 2,3,4 Units:mg/kg

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	<0.05
Chlorobenzene	0.31
1,2 - Dichlorobenzene	<0.05
1,3 - Dichlorobenzene	<0.05
1,4 - Dichlorobenzene	<0.05
Ethylbenzene	<0.05
Toluene	<0.05
Xylenes	<0.05

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by 7

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ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

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Purgable Aromatics
EPA #602

Client: ERM-WEST

Report #: 111265 Page

Sample Description: Boring 7A

Anlab ID #: 111265-27 Units: ug/l

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project: #204

COMPOUND	CONCENTRATION
Benzene	800
Chlorobenzene	<0.5
1,2 - Dichlorobenzene	<0.5
1,3 - Dichlorobenzene	<0.5
1,4 - Dichlorobenzene	<0.5
Ethylbenzene	1000
Toluene	140
Xylenes	1200

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
1,1 Dichloroethylene	200

n/a = not analyzed
n/d = none detected as specified in the EPA method

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A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #602

Client: ERM-WEST | Report #: 111359 | Page

Sample Description: Boring "O" | Anlab ID #: 111359-14 | Units: ug/l

Date sampled: 11/11 11/12/86 | Date received: 11/13/86
Project #204

COMPOUND	CONCENTRATION
Benzene	1200
Chlorobenzene	<0.5
1,2 - Dichlorobenzene	<0.5
1,3 - Dichlorobenzene	<0.5
1,4 - Dichlorobenzene	<0.5
Ethylbenzene	730
Toluene	2300
Xylenes	1000

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
1,1 Dichloroethyene	170

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ____ Report Approved by ____

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 23, 1986
Date Sampled: 11/11 11/12/86
Date Sample Received: 11/13/86
Report # 111265

ERM/WEST
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

ATTN: Dan Hinrichs

Project #204

Sample Description/ Anlab ID #	Total Petroleum Hydrocarbons By EPA #8015 "Modified. mg/kg
Boring 7A 111265-27	680

Data Certified By Ian Hirsch

Report Approved By Roger Elliott

sg

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 23, 1986
Date Sampled: 11/11 11/12/86
Date Sample Received: 11/13/86
Report # 111311

ERM/WEST
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

ATTN: Dan Hinrichs

Project #204

Sample Description/ Anlab ID #	Total Petroleum Hydrocarbons By EPA #8015 "Modified. mg/kg
Boring "I" 111311-21	36

Data Certified By ____________

Report Approved By ____________

sg

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

Purgable Aromatics
EPA #602

Client: ERM-WEST

Report #: 111311 Page

Sample Description: Boring I

Anlab ID #: 111311-21 Units: ug/1

Date sampled: 11/11 11/12/86 Date received: 11/13/86
Project: #204

COMPOUND	CONCENTRATION
Benzene	1700
Chlorobenzene	<0.5
1,2 - Dichlorobenzene	<0.5
1,3 - Dichlorobenzene	<0.5
1,4 - Dichlorobenzene	<0.5
Ethylbenzene	140
Toluene	870
Xylenes	97

OTHER COMPOUNDS DETECTED OR REQUESTED	CONCENTRATION
1,1 Dichloroethylene	180

n/a = not analyzed
n/d = none detected as specified in the EPA method

Data Certified by ______ Report Approved by ______

ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

December 23, 1986
Date Sampled: 11/11 11/12/86
Date Sample Received: 11/13/86
Report # 111359

ERM/WEST
2865 Sunrise Blvd.
Rancho Cordova, CA 95670

ATTN: Dan Hinrichs

Project #204

Sample Description/ Anlab ID #	Total Petroleum Hydrocarbons By EPA #8015 "Modified. mg/kg
Boring "O" 111359-14	7

Data Certified By ____________

Report Approved By ____________

sg

TITLE 22
LIST OF INORGANIC PERSISTANT
AND
BIOACCUMULATIVE TOXIC SUBSTANCES
AND
THEIR SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)
AND
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES

SUBSTANCE	STLC mg/l	TTLC WET-WEIGHT mg/kg
Antimony and/or antimony compounds	15	500
Arsenic and/or arsenic compounds	5.0	500
Asbestos	-	1.0 (as percent)
Barium and/or barium compounds (excluding barite)	100	10,000***
Beryllium and/or beryllium compounds	0.75	75
Cadmium and/or cadmium compounds	1.0	100
Chromium (VI) compounds	5	500
Chromium and/or chromium (III) compounds	560	2,500
Cobalt and/or cobalt compounds	80	8,000
Copper and/or copper compounds	25	2,500
Fluoride salts	180	18,000
Lead and/or lead compounds	5.0	1,000
Mercury and/or mercury compounds	0.2	20
Molybdenum and/or molybdenum compounds	350	3,500
Nickel and/or nickel compounds	20	2,000
Selenium and/or selenium compounds	1.0	100
Silver and/or silver compounds	5	500
Thallium and/or thallium compounds	7.0	700
Vanadium and/or vanadium compounds	24	2,400
Zinc and/or zinc compounds	250	5,000

*STLC and TTLC values are calculated on the concentrations of the elements, not the compunds

**In the case of asbestos and elemental metals, applies only if they are in a friable, powdered or finely divided state. Asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

***Excluding barium sulfate.

TITLE 22
LIST OF ORGANIC PERSISTANT
AND
BIOACCUMULATIVE TOXIC SUBSTANCES
AND
THEIR SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)
AND
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES

SUBSTANCE	STLC mg/l	TTLC WET-WEIGHT mg/kg
Aldrin	0.14	1.4
Chlordan	0.25	2.5
DDT, DDE, DDD	0.1	1.0
2,4 Dichlorophenoxyacetic acid	10	100
Dieldrin	0.8	8.0
Dioxin (2,3,7,8-TCDD)	0.001	0.01
Endrin	0.02	0.2
Heptachlor	0.47	4.7
Kepone	2.1	21
Lead compounds, organic	-	13
Lindane	0.4	4.0
Methoxychlor	10	100
Mirex	2.1	21
Pentachlorophenol	1.7	17
Polychlorinated biphenyls (PCBs)	5.0	50
Toxaphene	0.5	5
Trichloroethylene	204	2,040
2,4,5-Trichlorophenoxypropionic acid	1.0	10

APPENDIX B

DRAFT SITE MITIGATION PLAN
YOSEMITE OUTFALL PRODUCT

CITY OF SAN FRANCISCO
DEPARTMENT OF PUBLIC WORKS

DRAFT SITE MITIGATION PLAN
YOSEMITE OUTFALL PRODUCT

Prepared By:

ERM-West
Walnut Creek, California

March 27, 1987

ERM-West
Environmental Resources Management

1777 Botelho Drive • Suite 260 • Walnut Creek, California 94596-5022 ☎ (415) 946-0455
4630 Campus Drive • Suite 200 • Newport Beach, California 92660-1805 ☎ (714) 852-9490
2865 Sunrise Boulevard • Suite 105 • Rancho Cordova, California 95670-6538 ☎ (916) 635-7766

Reply To:

March 27, 1987

Rancho Cordova

Mr. Steve Medberry
Division Engineer
Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

Dear Steve:

Enclosed please find our draft Site Mitigation Plan for the creosote contaminated area for the Yosemite and Fitch Outfalls Consolidation Project.

The report includes a plan summary, plan objectives and approach, and discusses the site history and investigation that lead to the need for a site mitigation plan. Remedial action alternatives, the evaluation of those alternatives, and regulatory requirements are also addressed. Finally, a recommendation and general cost estimates are given.

We will be happy to meet with you and your staff to discuss this plan, and to answer any questions you may have regarding site mitigation for the area.

Best regards,

ERM-WEST

Melita Elmore (for)

Daniel J. Hinrichs
Principal Engineer

ME/lal/204

Enclosure - Noted

SITE MITIGATION PLAN

CONTENTS

CHAPTER 1

SUMMARY

A site mitigation plan was developed for the City of San Francisco Public Works Department to address subsurface creosote contamination encountered in an industrial area included in the proposed 16-block Yosemite-Fitch Outfalls Consolidation project. The specific study area encompasses a 3-block section in the City's Bayview district, and includes portions of Yosemite Avenue, Hanes Street, and Armstrong Street.

A brief review of site history, field investigations, and current site conditions is presented, and analytical data collected on soils, water, and oil product from the site is summarized. Applicable regulations concerning removal, treatment and disposal of on-site materials, and government agencies having jurisdiction are also reviewed.

General response actions aimed at affecting site remediation are described. These we subsequently evaluated through the use of screening factors and the consideration of site-specific conditions and criteria. From these general strategies three basic remedial alternatives are proposed which best accomplish site cleanup in a cost-effective manner while minimizing interference.

Pending a regulatory decision on the classification of constituents present in soil and water on-site, a single option for site mitigation will be recommended.

CHAPTER 2

PLAN OBJECTIVES AND APPROACH

The goal of this plan is to identify a recommended alternative for site remedial action. To achieve this goal, the plan must include the following:

- o Review site conditions
- o Identify/evaluate remedial action alternatives
- o Recommend a cleanup alternative

Beginning with a review of site conditions in Chapter 3, this plan addresses each of the above in a separate chapter.

Remedial action alternatives for the site are discussed in Chapter 4. Each alternative is evaluated based upon primary and secondary screening criteria. Using the site conditions data that are presented in Chapter 3, appropriate general response actions and companion technologies are identified. The technologies are then screened to eliminate those that are unsuitable or infeasible. This is done for both soil removal and disposal, and for product clean-up and disposal. Remedial actions include both on-site treatment and off-site treatment and disposal. Regulatory agencies requirements are also discussed.

The recommended alternative and a tentative cost estimate and schedule are presented in Chapter 5.

CHAPTER 3

SITE CONDITIONS

The City and County of San Francisco, Department of Public Works proposes to construct transport/storage facilities for industrial waste pipes in the City's Bayview area. This project is intended to reduce overflows and will transport wet and dry weather flows to a treatment plant. The proposed project, known as the Yosemite and Fitch Outfalls Consolidation Project, consists of a 16 block area surrounding the Fitch Street, Griffith Street and Yosemite Avenue outfalls. The area is a heavily industrialized zone.

The San Francisco Municipal Code, Chapter 10, Article 20 (also known as the Soil Analyses Code), provides that prior to excavation of more than 50 cubic yards of soil in certain industrial areas of San Francisco, a soil investigation must be undertaken to assess potential hazardous constituents. Prior to any construction, a site history must be determined, and soil (and, if encountered, water) samples must be collected. If hazardous constituents are determined to be present in concentrations above action levels, a site remediation plan should be implemented.

The outfall construction area mentioned above includes soils that consist of fine clayey silt with vegetative debris extending from ground level to approximately 15 feet. Below the silt layer is another level of silt that includes sand and fine oily grit. Below 15 feet, Bay Mud is encountered. Because the site is composed of fill material, the various sand and silt deposits are probably not continuous. Groundwater is brackish in quality and is influenced by nearby tidal channels. No commercial or domestic water use is known. Beneficial use of the groundwater is primarily recharge to the Bay.

The following will provide location details of the area, and will discuss the history of the area, along with a background of the site investigation that lead to the necessity of a remedial action plan for this area.

Location

As shown on Figure 3-1, the outfall project includes a 16 block area surrounding the Fitch Street, Griffith Street and Yosemite Avenue outfalls. The area of concern emcompasses a 3 block area including Hawes Street between Yosemite Avenue and Armstrong Street, and is shown on Figure 3-2. City property includes the street easement. To the north, the property is owned by Cruz Lumber, and includes the Yosemite Channel. To the south is a vacant lot and lumber yard owned by E.S. Brush and Sons. The South Basin outfall is to the east, and a parking lot for E.S. Brush is to the west.

Site History

A record search of the area's industries was conducted by Norman Grib, and is included as Attachment 1. The industries that were present either currently or in the past included lumber yards that conducted wood preserving activities. Based on these findings, ERM-West staff prepared a work plan to conduct the soil investigation. The proposed workplan (Attachment 2) was presented to the City of San Francisco in a November 3, 1986, letter. The analyses procedures and protocol were discussed, as were boring locations in this report.

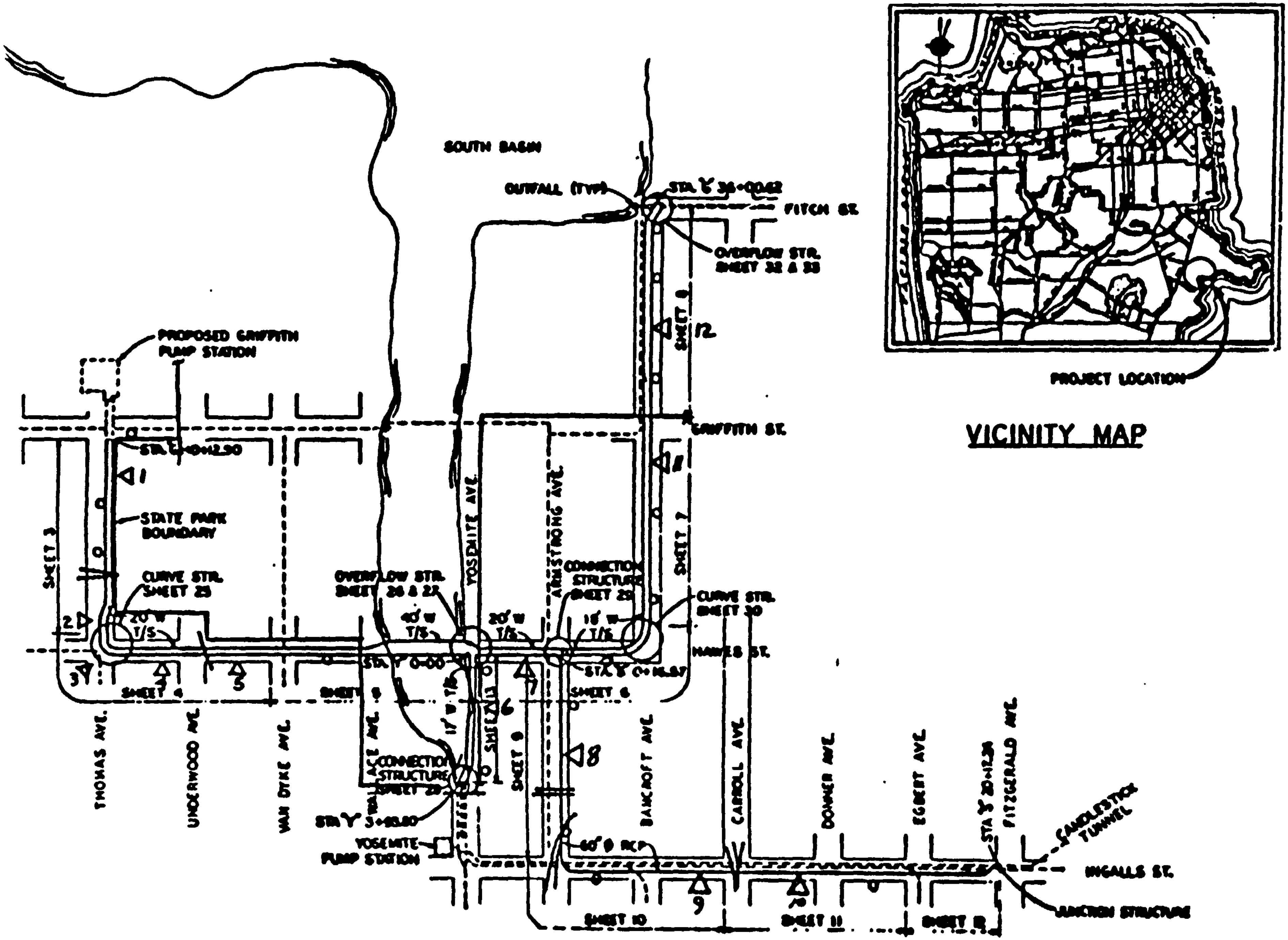


FIGURE 3-1 AREA MAP, YOSEMITE-FITCH OUTFALLS CONSOLIDATION PROJECT

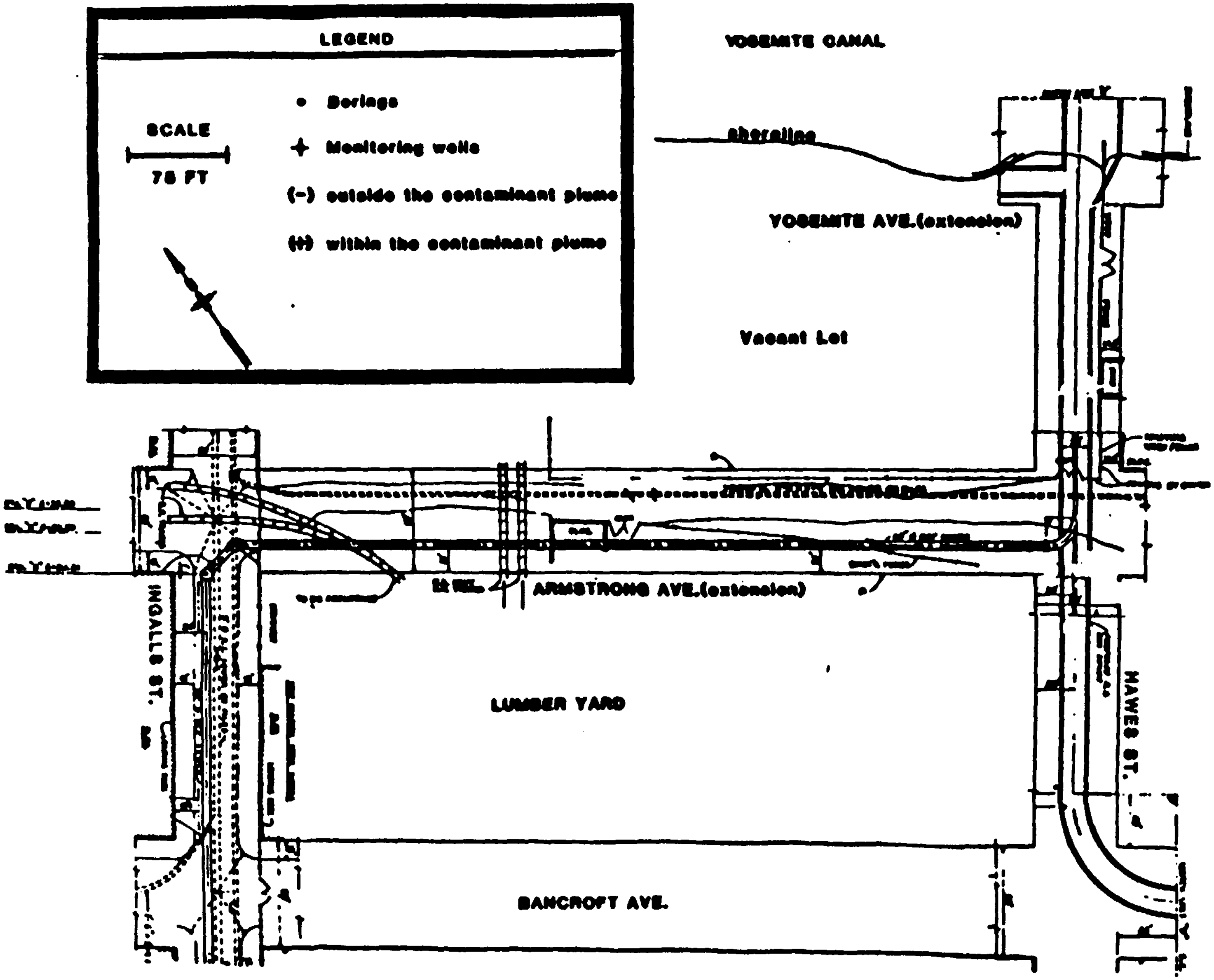


FIGURE 3-2 SITE DETAIL, ARMSTRONG AND HAWES

Site Investigation

On January 16, 1987, ERM-West staff presented soil and groundwater findings to the Department of Public Works in the attached (Attachment 3) report. The results of that report included a discussion of an area, known as Area 2, that encompassed the 3 block area of Yosemite Avenue, Hawes, and Armstrong Streets. Soil concentrations found in this area were determined to be listed, according to criteria in Title 22, California Administrative Code, as hazardous constituents.

In Area 2, samples indicated metals contamination (copper, zinc, lead, and mercury)in the soil, and purgeable aromatics (benzene, toluene, etc.) were found in the groundwater. Additionally in both the soil and groundwater, a black tarry substance was discovered. This material was described as having a creosote odor, and further investigation was deemed warranted. Subsequent analyses revealed the tarry product to be poly-nuclear aromatics; constituents and concentrations of the product and the contaminated soil are listed on Table 3-1.

In order to determine the extent of the creosote plume and in order to assess groundwater gradient, three observation wells were drilled on February 11, 12, 13, 1987 (as shown on Figure 3-3), and further monitoring was conducted. The observation well drilling logs are included in the Appendix.

TABLE 3-1

Constituents	Concentration mg/kg (unless otherwise noted)
Priority Pollutant Metals	
BE	0.4
CD	0.7
CR	50
Cu	94
Pb	76
Ni	46
Ag	0.6
Zn	180
Sb	<0.2
As	13
Se	<0.1
Ti	<0.06
Hg	0.012
Organic Compounds	
Acenaphthylene	0.19 mg/l
Anthracene	1.6 mg/l
Chrysene	0.36 mg/l
Flouranthene	1.3 mg/l
Flourene	0.38 mg/l
Napthalene	2.7 mg/l
Phenanthrene	0.82 mg/l
Pyrene	1.0 mg/l
pH	8.3 pH units

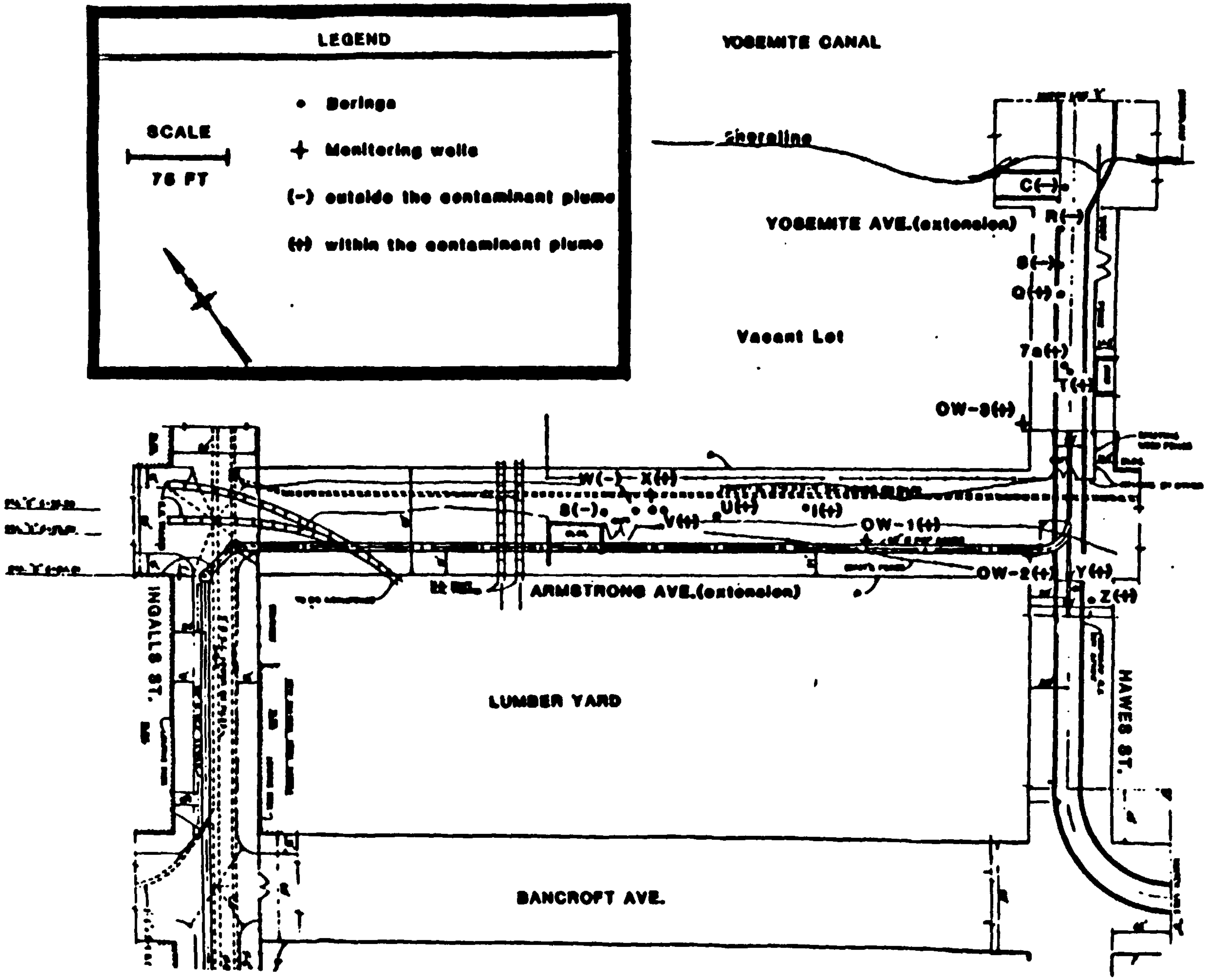


FIGURE 3-3 BORING AND MONITORING WELL LOCATIONS, ARMSTRONG AND HAWES

Based on preliminary investigations, the extent of the contamination appears to be limited to a 69,000 square foot area, and groundwater flow appears static. However, due to the floating product, groundwater gradient could not be determined. Figure 3-4 shows the probable contamination area. The area of greatest contamination appears to be near Observation Well OW-3. A site mitigation plan is necessary for this contaminated area before proceeding with sewer installation.

Various clean-up alternatives were considered and finally selected as is discussed in the following chapter.

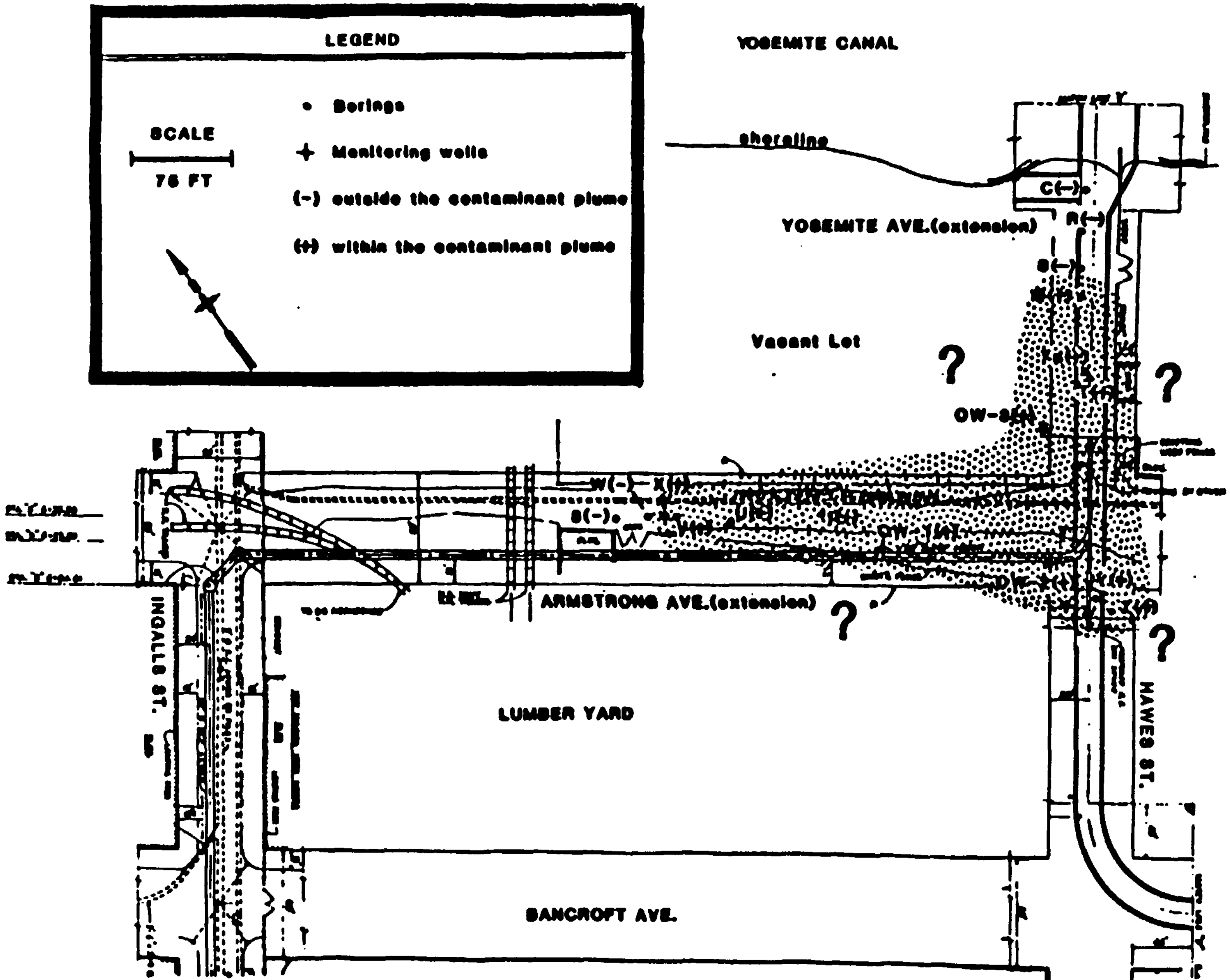


FIGURE 3-4 ESTIMATED EXTENT OF SUBSURFACE CONTAMINANT PLUME, ARMSTRONG AND HAWES

CHAPTER 4

REMEDIAL ACTION ALTERNATIVES

Remedial action alternatives were identified through a process that utilizes a trenching operation to reach the soil and groundwater contamination. The evaluation process began by identifying potential General Response Actions that might be taken in response to site conditions, and considering those actions with various available technologies. General response actions identified for this study include: 1) no action; 2) containment of contaminants on-site; 3) treatment of contaminants on-site, and 4) removal of contaminants for off-site treatment and/or disposal. These actions are not mutually exclusive but rather can be combined.

As no single, general response action is likely to provide an optimum cleanup evaluation, the most feasible combinations of specific technologies were combined into several alternatives which were compared to feasibility considerations. As a result of this evaluation, the following three alternatives were selected:

- Alternative 1 - install a narrow trench to several feet below groundwater, which would involve an excavation top width of 10-14 feet in lieu of shoring. Excavation to the Bay mud is also an option, but this would involve an excavation top width of 20-25 feet. Product would be skimmed off the trench and placed in 55 gallon drums for disposal to a Class I facility. Decanted water would be sent to the sanitary sewer. The trench would be located offset to where sewer installation begins. Disposal of the contaminated soil to an appropriate facility is also necessary.

- Alternative 2 - Same as option 1, except the trench would be located over the line where the sewer would be installed. A modification suggested for Alternative 2 (called 2b) is the installation of rock immediately upon trenching so as to eliminate the need for shoring or a wide trenching operation. Both Alternative 1 and 2 (and 2b) would be conducted prior to sewer installation.

- Alternative 3 - Same as Alternative 2, except the trenching would be conducted during the sewer construction. The shored construction trench would be built using conventional procedures and contaminated soil would be removed as the trench work progresses. Contaminated soil would be stockpiled separately. Noted that all three options will include removal of as much product from the observations wells as is feasible prior to the trenching operation.

REGULATORY REQUIREMENTS

Several Federal, State and local agencies are involved in regulating hazardous waste pursuant to both legislative and regulatory requirements. These regulations dictate what remedial action technology can be taken and how these actions are to be implemented. The following agencies regulate hazardous waste handling, treatment, and disposal operations:

- U.S. Environmental Protection Agency (EPA)
- U.S. Department of Transportation (DOT)
- California Department of Health Services (DHS)
- California Regional Water Quality Control Board (RWQCB)
- Bay Area Air Quality Management District (BAAQMD)

In addition, the City of San Francisco as operator of a Publically Owned Treatment Works, (POTW), serving the site, has regulatory power over wastewater discharges to the sanitary sewer system resulting from site activities.

The EPA regulates hazardous waste storage, treatment and disposal and the DOT regulates hazardous materials transportation in accordance with the Code of Federal Regulations (CFR) 40 and 49, respectively. The DHS also regulates the storage, treatment and disposal of hazardous waste in accordance with Articles 1 through 34 of Chapter 30, Title 22, of the California Administrative Code (CAC). The RWQCB protects the quality of waters of the State in accordance with the Porter-Cologne Water Quality Control Act. The RWQCB also regulates the discharge of pollutants to waters of the State with NPDES Permits as required by the Federal Water Pollution Control Act (Clean Water Act). Publicly Owned Treatment Works (POTW) regulate discharges to the sanitary sewer system. The discharge limits are based upon regulatory requirements as well as treatment standards. Discharges to a sanitary sewer must have prior approval from the POTW. The BAAQMD is a local regulatory agency that has authority to regulate discharges to the air from stationary sources in accordance with the California Health and Safety Code.

To minimize potential impacts to human health and the environment, discharge limits to surface water, groundwater, soil, and air have been established through various regulations. In addition to enforceable regulations, several exposure criteria have been established to protect human health, aquatic life, and the environment. This will be submitted under separate cover in a Health and Safety Plan.

SCREENING FACTORS

Screening factors are used to evaluate potential remedial alternatives assembled from the various technologies that passed consideration. The purpose of these screening factors is to identify the alternative within each general response action category that best responds to site needs and concerns. Table 4-1 lists the screening factors and summarizes the rationale for these factors. These factors were considered when selecting the three above mentioned alternatives.

TABLE 4-1

DESCRIPTION OF SCREENING FACTORS

Screening Factor	Rationale/Significance
Effectiveness	Need for adequate and permanent remediation that allows future development and use of site.
Reliability	Need for proven technologies producing predictable results leading to documentable remediation.
Public Acceptance	Need for remedial strategy that is compatible with public awareness of problems and that inspires public confidence in effectiveness of measures.
By Products of Remedial Measures	Need for contaminant destruction or transfer to media that are more environmentally sound/ manageable than those found on-site.
Institutional Factors	Need to obtain proper clearance, permits, variances, etc., from various agencies having local or regional jurisdiction.
Environmental and Public Health	Need for an overall remedial strategy that results in adequate site restoration while minimizing adverse impact on the environment and risk to public health.
Safety	Need for remedial technologies that do not generate safety problems as a result of their installation/operation.

GENERAL RESPONSE ACTIONS

As previously mentioned, general response actions can be grouped into four main categories: no action, containment, treatment, and removal.

The no action response would consist of continued monitoring of groundwater movement in and around the site, in addition to continuing analysis of environmental conditions. The primary objective of the no action option would be continued verification that no significant off-site migration of contaminants has occurred in the defined contamination area. Re-routing of the sewer would be necessary through the area, and therefore this is not an acceptable response.

The containment response would be comprised of actions intended to eliminate potential pathways for off-site movement of contaminants after sewer construction. This would include preventing or greatly reducing groundwater movement from the site, eliminating groundwater recharge to the site, and/or preventing off-site movement of surface contaminants from the site via runoff or air movement.

Containment responses can be classed as either active (or dynamic) and passive (or static). Active containment, which would apply to groundwater, involves pumping or otherwise conveying groundwater from an aquifer in order to change the normal direction and flow rate of groundwater movement. By continuously removing groundwater from a given area, groundwater flow in the vicinity is redirected toward the point of removal. The overall effect is that contaminated groundwater is prevented from moving off-site, and is thus effectively contained. A variation of this process would include recharge facilities strategically located to further aid in containing groundwater.

The active containment measures also include appropriate groundwater removal techniques that can be incorporated into treatment or removal response actions (see below).

Passive containment involves the placement of physical barriers around a contaminated zone in order to prevent or minimize vertical or horizontal movement. Off-site migration is prevented not by changing the direction and rate of migration of constituents, but by physically controlling their movement.

Although containment technologies focus on preventing waterborne migration of constituents (in either groundwater or surface runoff), soil contaminants are also effectively immobilized. The flow of water is the principal mechanism by which chemical constituents are released from soils, either by percolating through the vadose zone to the groundwater table or by conveying surface soil contaminants off-site in runoff. Thus, containment serves to isolate soils from waters that would otherwise spread contamination. It also prevents wind-blown migration of contaminated surface soils. Due to the various neighboring property owners, the nature of the Soil Analyses Code, and the non-definition of the contamination plume, containment is not a feasible response action. Containment is also not feasible due to excavation through the bay mud during construction.

The treatment response actively alters, removes, or destroys chemical constituents present in site soils or groundwaters, with the ultimate goal of reducing contaminant concentrations to levels considered "acceptable" by regulatory agencies having jurisdiction. Treatment approaches can be grouped into the following three main categories:

- off-site treatment: soils and groundwaters are physically removed and transported to facilities located off-site where they are subsequently treated. Treated materials would typically be disposed of off-site, and clean replacement fill brought on-site.

- on-site treatment: soils and groundwaters are physically removed but treated on-site by mobile or "package" treatment units. Depending on the nature of the treatment method, the treated soils may or may not be returned to the site, while treated groundwaters can either be recharged into the aquifer or disposed of into a sanitary or a storm sewer system. Any by-products of the treatment processes, if considered hazardous, would be removed and taken to an off-site facility for additional treatment and/or disposal.

- in-situ treatment: soils and groundwaters are treated in place. Some disturbance of these materials during treatment may occur, but no bulk movement within or from the site is undertaken. Hazardous by-products that may be generated would be treated and/or disposed of off-site.

In general, treatment involves biological, chemical physical separation or thermal destruction of target constituents, alteration of constituents to less toxic forms, or removal of constituents from the contaminated medium (i.e., soil or groundwater) and concentration onto another medium (e.g., a solvent, granular activated carbon, etc.) more suitable for subsequent treatment and/or disposal. the treatment of soil and groundwater by one or more of these combinations <u>is</u> an acceptable response action.

The final general response action to be considered is removal of contaminated materials and their disposal at an approved off-site facility. The degree of removal could consist of complete excavation of the uppermost 15 feet of contaminated soil and removal of the groundwater. Removal of contaminated material <u>is</u> also an acceptable response.

The four general response actions outlined above are not mutually exclusive. A final remedial strategy developed for a given site may include components from two or more general response categories as is the case here. The three alternatives mentioned above were selected after consideration of all technology options, regulatory considerations, the screening factors listed in Table 4-1, and the feasibility of the four general response actions. The next step is selection of an alternative for recommendation.

CHAPTER 5

RECOMMENDED ALTERNATIVES

The following is a discussion of the advantages and/or disadvantages of each alternative, with a general cost breakdown for each one. The section concludes with our recommendation that is the most feasible, cost effective method for remediation of the contaminated area.

Alternative 1 - The offset of the proposed trench line may cause potential problems with easements and right-of-way permission. Portions of the proposed trench will be encroaching onto private property, some of which were probably a contributing factor to the original contamination problem. The use of private property easements may also add to the cost of the construction if payment and/or additional clean-up after construction is necessary.

Alternative 2 - This appears to be the most feasible, due to the attraction of trenching along the line of the proposed sewer. The excavation will not be disruptive to additional areas, and no private property owner permission will be necessary since the sewer line will be installed along City easement. Alternative 2b has all the advantages of Alternative 2, but does have the added disadvantage of adding potential disposal costs when the contaminated rock must be removed. The principal advantage is elimination of either shoring or the wide trench.

Alternative 3 - This option leaves open the possibility of time delay, if the trenching is left until the construction of the sewer. With the hazardous constituents believed present, it may be imperative to conduct additional sampling and/or monitoring once the contamination is exposed during excavation. This could mean a stop-work order if safety procedures are compromised. If this occurs during the installation of the sewer pipe, rather than before, a serious work delay could result.

Cost Estimate [1]

Alternative 1	$90,000
Alternative 2	$65,000
Alternative 2b	$55,000
Alternative 3	$100,000

(1) Costs do not include disposal of contaminated soil or creosote.

RECOMMENDATION

If creosote waste is accepted as a designated waste, then Alternative 2b should be selected. If creosote waste is classified as a hazardous waste, then Alternative 2 should be selected. We also recommend that whatever alternative is used, that Baker tanks be on-site as a water-holding container. Residue product may then be skimmed off and disposed accordingly.

ATTACHMENT 1

SITE HISTORY REPORT
YOSEMITE AND FITCH OUTFALLS CONSOLIDATION
GRIFFITH PUMP STATION AND FORCE MAINS

1. Block and lot numbers and address of the proposed project.

   See blue prints entitled General Plans and Notes (File No. 47713) for Yosemite and Fitch Outfalls Consolidation, and blue prints entitled Griffith Pump Station and Force Mains (Sheet A and B) for Griffith Street portion.

   The blocks contingent to this project are notated on the enclosed map from the Sanborn Company, entitled Sanborn Block Map.

2. The Building Application Number assigned to the project.

   Not applicable. No building permit required.

3. The names, addresses and phone number of the following:

   A. Contractor - Homer J. Olsen, 1275 Michigan St., San Francisco, California 94107, 415/824-1440

   B. Property Owner - City of San Francisco

   C. Project Coordinator - Mr. Bob Swanstrom, 770 Golden Gate Ave., 3rd floor, San Francisco, California 94102 415/558-2131

   D. Architect - Verl Hall, San Francisco City Architect's Office, 45 Hyde Street, San Francisco, California 94102 415/558-4527

   E. Site History Preparer - Norman L. Grib, Ph.D.,P.E., 2655 Franklin Street, San Francisco, California 94123 415/928-5384

4. The education and experience of the site history preparer.

   Ph.D. Chemical Engineering
   Registered California Chemical Engineer. Fifteen years experience in environmental engineering. Five years experience in hazardous wastes area. Involved in site history analysis for past two years.

5. Provide a plot map of proposed project.

   See attached blue prints entitled: General Plans and Notes (File No. 47713)
   Griffith Pump Station and Force Main (Sheet
   Griffith Pump Station and Force Main (Sheet

   The location of proposed sampling bores are indicated in red.

5. Cont'd.

Holes will be drilled to the bottom of the proposed excavation (Varies to a maximum of 32 feet) or the the top of the bay mud layer. If analysis reveal chemicals that may permeate bay mud, drilling through the bay mud will be done.

The location of structural core samples are given in Plate 1 Geotechnical Map, Geotechnical Investigation, February, 1985.

6. Statement from Soil Engineer that the result of the proposed sampling program is in his judgement representative of the proposed excavation site conditions.

See last paragraph of letter from Daniel Hinrichs, Principal Engineer, ERM-West Co., dated November 3, 1986.

7. Scope and extent of soil excavation proposed.

A. Lineal foot dimensions: Approximately 3500 feet of 10 foot wide trench, approximately 4200 feet of 26 foot wide trench and approximately 300 feet of 46 foot wide trench. Depth of trench will vary depending on ground elevation. Average depth will be approximately 25 feet.

The excavation for the pump station will be approximately 50 feet wide, 90 feet in length, and to a depth of approximately 30 feet.

Details of length and width of the trench are shown on the plot maps mentioned in item #5 above. Width of trenches have been estimated by adding 6 feet to sewer box widths. Width of the force main on Griffith and the sewer pipe on Ingalls has been estimated at 10 feet in terms of excavation.

B. Any excavation during all phases of construction.

See above.

C. All landscaping planned.

See attached Yosemite and Fitch Outfalls Consolidation (file 47756) drawing: Site Plan, Berm Construction Plan, Planting Schedule and Plan.

See attached Griffith Pump Station and Force Mains (file 56283) drawing: Planting Plan

D. The relationship of the proposed excavation site to the total project.

The proposed project is required to provide transport/storage facilities which would reduce overflows from approximately 46 per year to an annual average of one. It would transport wet

7. D, Cont'd.

and dry weather flows to a treatment plant.

The proposed project would collect the flows from the existing Fitch Street, Griffith Street, and Yosemite Avenue outfalls and convey them to the proposed 120 million gallon a day Griffith Pump Station. This station would than pump both wet weather and dry weather flow to the Southeast Water Pollution Control Plant for treatment.

8. Detailed land-use research for the excavation site and adjacent land.

A. The following Sanborn Maps were used:

1985 (Planning Department)
1973 (Recorders Office)
1965 (Bancroft Library)
1951 (Heritage Foundation)
1950 (U.C. Main Library)
1929 (Bancroft Library)
1915 (U.C. Main Library)

In all cases Volume 8, Plate Nos. 834, 836, 838, and 897 were used.

Other references used:

Chemical Process Industries, Norris Shreve, 3rd Edit.,1967, McGraw-Hill,N.Y.

Industrial Waste Treatment Practice, E.F. Eldridge, 1st Edit.,1942, McGraw-Hill Book Co.,N.Y.

B. Type of land uses conducted on the areas under study.

See Table I and indicated Sanborn Maps

The vacant areas indicated on the map are land that has been filled but not utilized. At page 8 of the Geotechnical Investigation, the fill as exposed by the structural borings contains wood, boulders, large blocks of construction debris brick and concrete slabs.

TABLE I

SAMPLE LOCATIONS

SAMPLE NO.	LOCATION	REASON **
*1.	Thomas and Hawes	Tallow company and Curled Hair Fac: (1915)
*2.	Thomas between Griffith and Hawes	Manufacture of metal specialties fo reinforcing concrete (1965)
3.	Hawes between Yosemite and Armstrong	Lumber Yard (1973)
4.	Armstrong between Hawes and Ingalls	Lumber storage (1973)
5.	Yosemite between Hawes and Ingalls	Lumber manufacturing (1973)
*6.	Thomas and Hawes	Hazardous Waste/Drum recycler (1985)
*7.	Thomas and Hawes	Very oily auto repair yard (1985)
8.	Hawes between Van Dyke and Underwood	Metal scrap yard (1985)
*9.	Carroll and Ingalls	Chemical Manufacturing (1985)
*10.	Carroll and Ingalls	Industrial Chemical Warehouse and Auto and Truck Repair (1985)
1A.	Griffith between Shafter and Revere	Norton Wool Co. Later Legallet Wool Co. (1950)
1B.	Griffith between Revere and Quesada	Legallet Tanning Co. (1950)
1C.	Griffith between Quesada and Palou	Wood processing, fire place logs (19

* Outside Eddy Red Line Boundary

** Data facility first appears in Sanborn Map book

9. Suspected chemical substances used or produced, probable years of use and production. (For years of production see Table I.

Sample No.	Land Use	Probable Chemical Substances
1.	Tallow Co., Curled Hair Fact.	Acid, Oil and Grease
2.	Manuf. of metal spec. for reinforced concrete	Acid, cyanides*
3.	Lumber Yard	Copper, Mercury, formalin creosote, chlorinated phenols**
4.	Lumber storage	same as #3
5.	Lumber manuf.	same as #3
6.	Hazardous waste drum recycler	pesticides in criteria list
7.	Oily auto repair	Oil and Grease
8.	Metal Scrap Yard	Chrome, copper, lead
9.	Chemical Manuf.	Criteria list
10.	Ind. Chemical W.Ho. and Auto Repair	Criteria list and oil and grease
1A.	Norton Wool Co. Legallet Wool Co.	Naptha, Carbon Tetrachloride, carbon disulphide, oil and grease, sodium sulphide, napthol, acid, sodium nitrite, paranitraniline resorcine.
1B.	Legallet Tanning Co.	calcium sulphide, chromium salts, aluminum salts, acid, phenols, sulfonated phenols, formaldehyde*,**
1C.	Wood Processing Fire place logs	Same as #3, and oil and grease

* Industrial Waste Treatment Practice, E.F. Eldrige, 1st Ed.,1942, McGraw Hill, N.Y.

** Chemical Process Industries, Norris Shreve, 3rd Ed.,1967, McGraw Hill, N.Y.

10. A statement from the Site History preparer, that in his judgement the Site History is accrurate and complete.

As the Site History preparer, I hereby state that this Site History is accurate and complete.

Signed. [signature]

Dated. 11/11/56

ATTACHMENT 2

ERM-West
Environmental Resources Management

1777 Botelho Drive • Suite 260 • Walnut Creek, California 94596-5022 ☎ (415) 946-0455
4630 Campus Drive • Suite 200 • Newport Beach, California 92660-1805 ☎ (714) 852-9490
2865 Sunrise Boulevard • Suite 105 • Rancho Cordova, California 95670-6538 ☎ (916) 635-7766

Reply To:
Rancho Cordova

November 3, 1986

Mr. Steve Medberry
Division Engineer
Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

SUBJECT: Hazardous Waste Investigation Yosemite and Fitch Outfalls Consolidation

Dear Steve:

The City and County of San Francisco, Department of Public Works propose to construct transport/storage facilities for industrial waste lines. This project will reduce overflows and will transport wet and dry weather flows to a treatment plant. The proposed project consists of a 16 block area surrounding the Fitch Street, Griffith Street and Yosemite Avenue outfalls, and is located in a heavily industrialized area.

Prior to construction, a hazardous waste investigation will be conducted. Based on records search of the area by Norman Grib, the industries present were of the type that we would expect the presence of inorganics, fuels, oils, other organics, and heavy metals. We will initially take preliminary samples - the approximate sample locations are shown on the map as circles - and check those borings with an organic vapor analyzer. If positive results are found, soil samples will be taken for further analyses. Soil and/or groundwater samples will also be taken for laboratory testing at those locations represented on the map with triangles and numbered 1 through 12.

Laboratory analyses to be conducted include:

1. Inorganic Toxic Substances
2. Volatile Organic Toxic Pollutants
3. PCBs
4. pH
5. Flammability
6. Cyanides
7. Sulfides
8. Methane and other flammable gases

These are the constituents required to be analyzed by the San Francisco Municipal Code, Chapter 10, Article 20 (Soils Analyses Code). Additionally, we recommend that Samples No. 7 and 8 are also analyzed for cresote, pentachlorophenol, and phenol. These sample points are located by lumber yards where wood may have been treated with a preservative.

Composite soil samples will be tested. Individual samples will be preserved in the event that more information is needed or contamination is found. Holes will be drilled to the bottom of the proposed excavation (varies to a maximum of 32 feet) or to the top of the bay mud layer. We may also drill through the bay mud in several locations if further investigations reveal that neighboring industries produce(d) chemicals that may permeate bay muds. Mr. Grib is to provide a list of the possible chemicals present from the nearby businesses.

If all results are less than allowable limits as noted in the Soil Analyses Code, then a report will be prepared stating these results. If limits are exceeded, additional testing will be done. The extent of the testing will depend on original results and location of problem(s). A determination will also be required as to the means of cleanup. All sampling and analyses will be conducted according to approved methodology as stated in the Soils Analyses Code.

The result of the proposed sampling program is, in my judgment, representative of the proposed excavation site conditions. Upon completion of this work and review of the results, I will repeat the above statement except the word proposed will be deleted.

If you have any questions, please call me.

Sincerely yours,

ERM-West

Melita Elmore (for)

Daniel Hinrichs
Principal Engineer

DH/lal/192

cc: Norman Grib
Tom Ikesaki
Melita Elmore

ERM-West
Environmental Resources Management

1777 Botelho Drive · Suite 260 · Walnut Creek, California 94596-5022 ☎ (415) 946-0455
4630 Campus Drive · Suite 200 · Newport Beach, California 92660-1805 ☎ (714) 852-9490
2865 Sunrise Boulevard · Suite 105 · Rancho Cordova, California 95670-6538 ☎ (916) 635-7766

Reply To:

November 4, 1986

Rancho Cordova

Mr. Steve Medberry
Division Engineer
Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

SUBJECT: Budget Estimate for Hazardous Waste Investigation Yosemite and Fitch Outfalls Consolidation

Dear Steve:

This is written as an addendum to our November 3, 1986, proposal for a hazardous waste investigation for the Yosemite and Fitch Outfalls Consolidation.

ERM-West will invoice for time and material expenses for this project, and estimates that the project will be approximately $35,000. This is based on the proposed sampling locations referred in our November 3 letter to you.

We estimate that standard laboratory analysis turn-around will be 2-3 weeks. If a faster turn-around is needed, a premium will be added to our budget estimate. We estimate that an increase of $5,000 will be necessary for a rush turn-around of 1-1 1/2 weeks.

If additional information is needed, please feel free to call me.

Sincerely,

ERM-West

Melita Elmore (for)

Daniel J. Hinrichs,
Principal Engineer

DJH/lal/192

ATTACHMENT 3

TITLE 22
LIST OF ORGANIC PERSISTANT
AND
BIOACCUMULATIVE TOXIC SUBSTANCES
AND
THEIR SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)
AND
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES

SUBSTANCE	STLC mg/l	TTLC WET-WEIGHT mg/kg
Aldrin	0.14	1.4
Chlordan	0.25	2.5
DDT, DDE, DDD	0.1	1.0
2,4 Dichlorophenoxyacetic acid	10	100
Dieldrin	0.8	8.0
Dioxin (2,3,7,8-TCDD)	0.001	0.01
Endrin	0.02	0.2
Heptachlor	0.47	4.7
Kepone	2.1	21
Lead compounds, organic	-	13
Lindane	0.4	4.0
Methoxychlor	10	100
Mirex	2.1	21
Pentachlorophenol	1.7	17
Polychlorinated biphenyls (PCBs)	5.0	50
Toxaphene	0.5	5
Trichloroethylene	204	2,040
2,4,5-Trichlorophenoxypropionic acid	1.0	10

TITLE 22
LIST OF INORGANIC PERSISTANT
AND
BIOACCUMULATIVE TOXIC SUBSTANCES
AND
THEIR SOLUBLE THRESHOLD LIMIT CONCENTRATION (STLC)
AND
TOTAL THRESHOLD LIMIT CONCENTRATION (TTLC) VALUES

SUBSTANCE	STLC mg/l	TTLC WET-WEIGHT mg/kg
Antimony and/or antimony compounds	15	500
Arsenic and/or arsenic compounds	5.0	500
Asbestos	-	1.0 (as percent)
Barium and/or barium compounds (excluding barite)	100	10,000***
Beryllium and/or beryllium compounds	0.75	75
Cadmium and/or cadmium compounds	1.0	100
Chromium (VI) compounds	5	500
Chromium and/or chromium (III) compounds	560	2,500
Cobalt and/or cobalt compounds	80	8,000
Copper and/or copper compounds	25	2,500
Fluoride salts	180	18,000
Lead and/or lead compounds	5.0	1,000
Mercury and/or mercury compounds	0.2	20
Molybdenum and/or molybdenum compounds	350	3,500
Nickel and/or nickel compounds	20	2,000
Selenium and/or selenium compounds	1.0	100
Silver and/or silver compounds	5	500
Thallium and/or thallium compounds	7.0	700
Vanadium and/or vanadium compounds	24	2,400
Zinc and/or zinc compounds	250	5,000

*STLC and TTLC values are calculated on the concentrations of the elements, not the compunds

**In the case of asbestos and elemental metals, applies only if they are in a friable, powdered or finely divided state. Asbestos includes chrysotile, amosite, crocidolite, tremolite, anthophyllite, and actinolite.

***Excluding barium sulfate.

APPENDIX

DRILLING LOGS

Environmental Resources Management

Drilling

Project Yosemite Fitch Outfall Owner S.F. Public Works Dept

Location Armstrong & Hawes W.O. Number 204

Well Number OW-1 Total Depth 12' Diameter 10"

Surface Elevation 0.84 (TS) Water Level: Initial — 24-hrs 2.52' [illegible]

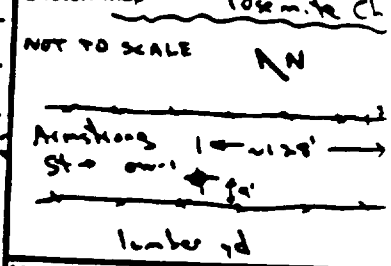
Screen: Dia. 4" Length 5' Slot Size 0.020"

Casing: Dia. 4" Length 9.5' Type PVC

Drilling Company ENEXCO Drilling Method hollow stem

Driller B. Jarvis Log By DC Date Drilled 2-11-87 1:15 PM

Sketch Map



Notes
128' w/NW and 9' N/ of fence cnrs

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)
1				easy drilling: cuttings - clay, sandy, w/rocks
2				
3			9" rec	split spoon (1½" dia.) clay, brown, minor sand and small white rock fragments, dense, wet, faint "tarry" (HC) odor bottom 3" (3'6"-3'9"): clay, silty, soft, black, heavy tarry staining and odor, wet
4	(CL)			
5			15" rec	slough: clay, brown, some sand and rocks, moist clay as above, some sand, rocks, tight, some brick and rock fragments (large). bottom 3" (6'0"-6'3"): sand, grit-like, black, tarry odor, sampler came up dripping: ~12" of heavy tarry film on rod, below that wet but not tarry
6				
7				
8			1:509	clay, black, wet and runny, some sand and rocks tarry film but soil not saturated with tar
9				last shelby (9-10.5 ft): clay, brown, some rocks dense, tarry only on outside of sample
10				bottom 4" plug (~10'2"-10'6"); Bay Mud (silt gray-green, soft, H_2S odor), tarry on outside only
11	(OL)			
12				
13	BOH			Drilled to 13', pulled out and pushed casing to 12'

Environmental Resources Management

Drilling L

Project Yosemite Fitch Outfall Owner S.F. Public Works Dept
Location Armstrong & Hawes W.O. Number 204
Well Number OW-1 Total Depth 12' Diameter 10"
Surface Elevation 0.084 Water Level: Initial - 24-hrs 2.5'
Screen: Dia. 4" Length 5' Slot Size 0.020"
Casing: Dia. 4" Length 9.5' Type PVC
Drilling Company ENEXCO Drilling Method hollow stem
Driller B. Davis Log By DC Date Drilled 2-11-89

Sketch Map

(see p. 1)

Notes

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)

Well Construction Details

9'-12' (below grade): solid PVC, 4" dia.
4'-9' (" "): wire wound PVC, 4" dia., 0.020" slot
+2.5 - 4' solid PVC, 4" dia.
Lonestar # 3 sand : 3' - 10.5'
bentonite (granular) : 2' - 3' (annular seal)
concrete : 0 - 2' (surface seal)

well completed ~2.5' above grade
locking utility cover pipe installed over casing (casing is ~6" below cover)

well development - ~55 gal of oily water removed w/ guzzler pump 2/25/89

light sheen and some oil globules in water

Environmental Resources Management

Drilling L[illegible]

Project: Yosemite/Fitch Outfall | Owner: San Fran Public Works
Location: Armstrong @ Hawes | W.O. Number: 204
Well Number: OW-2 | Total Depth: 12.5' | Diameter: 10"
Surface Elevation: 1.41' | Water Level: Initial: – | 24-hrs: 5.42' [illegible]
Screen: Dia. 4" | Length: 5' | Slot Size: 0.020"
Casing: Dia. 4" | Length: 11' | Type: PVC
Drilling Company: ENEXCO | Drilling Method: hollow stem
Driller: B. Davis | Log By: DC | Date Drilled: 2-12-87 8:50A

Sketch Map
Yosemite channel
NOT TO SCALE N
Armstrong St.
OW-2
lumber yd

Notes
18' N/NE and 1' W/NW of fence corner

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)
1				easy drilling: cuttings clay, sandy, w/gravel, moist, loose, no odor
2				water in open hole (2') @ ~1.8' : NOT TARRY
3	(SC)		10" rec	split spoon: sand, fine to med., clayey, rocks, wet/runny, no odor
4				black fibrous material (wood?) some sand and rocks, soft, wet, black, tarry odor, staining (sample; 9:20A)
5			3" rec	shelby @ 5' bouncing (wood?) : debris (wire, glass) and rocks, some sand and clay, black, tarry,
6			12" rec	runny. split spoon (5'10") debris as above, w/rocks, some sand and clay, black, tarry, runny
7	(MH)			(7'-7'4"): silt, gray-green, soft, sticky, Bay Mud odor inside, tarry film outside
8				attempted shelby @ 8' but sample fell out
9				
10	(OL)		22" rec	top 4" slough: tarry debris, as above; Bay Mud, tarry on outside only
11				easy drilling
12				lead auger: Bay Mud, tarry outer film
13	BOH			

Environmental Resources Management

Drilling

Project Yosemite/Fitch Outfall Owner San Fran Public Works
Location Armstrong & Hawes W.O. Number 204
Well Number OW-2 Total Depth 12.5' Diameter 10"
Surface Elevation 2.41' Water Level: Initial — 24-hrs. 5.42'
Screen: Dia. 4" Length 5' Slot Size 0.020"
Casing: Dia. 4" Length 11' Type PVC
Drilling Company ENEXCO Drilling Method hollow stem
Driller B. Jarvis Log By DE Date Drilled 2-12-89

Sketch Map

(see p. 1)

Notes

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)

Well Construction Details

7.5' - 12.5' (below grade) : solid PVC, 4" dia
2.5' - 7.5' (" ") wire-wound PVC, 2" dia., 0.020" slot
+3.5 - 2.5' : solid PVC, 4" dia.

sand, unwashed, not well sorted 2' - 9'
bentonite (pellets) 9' - 12'
bentonite (granular) 1' - 2' (annular seal)
concrete 0' - 1' (surface seal)

well completed 3.5' above grade
locking utility cover pipe installed over casing (casing is ~5" below cover)

well development - ~55 gal of oily water removed w/ guzzler pump 2/25/89

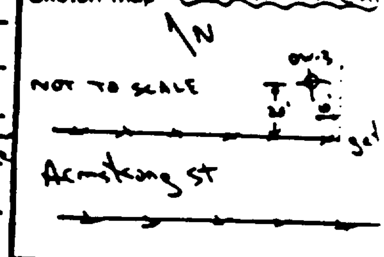
oil content in this well appears to be intermediate between OW-1 (less) and OW-3 (more)

Environmental Resources Management

Drilling Log

Project: Yosemite/Fitch outfalls Owner: S.F. Public Works
Location: Armstrong & Hawes Sts. W.O. Number: 204
Well Number: OW-3 Total Depth: 12' Diameter: 10"
Surface Elevation: -1.26' Water Level: Initial: — 24-hrs. 3.31' below grade
Screen: Dia. 4" Length 5' Slot Size 0.020"
Casing: Dia. 4" Length 6.5' Type PVC
Drilling Company: ENEXCO Drilling Method: hollow stem
Driller: B. Jarvis Log By: DC Date Drilled: 2-12-87 1:20P

Sketch Map: Yosemite st



Notes: hard rain

Depth (Feet)	Graphic Log	Well Construction	Sample Number
1		solid PVC	
2		solid PVC	
3		slotted PVC (4" dia, 0.020" slot)	12" rec
4		slotted PVC (4" dia, 0.020" slot)	12" rec
5	(SW)	slotted PVC (4" dia, 0.020" slot)	12" rec
6		slotted PVC (4" dia, 0.020" slot)	8" rec
7		slotted PVC (4" dia, 0.020" slot)	12" rec
8		slotted PVC (4" dia, 0.020" slot)	refusal ↓
9		solid PVC (4" dia)	refusal ↓
10	?	solid PVC (4" dia)	
11	(OL)	solid PVC (4" dia)	full rec
12			
13	BOH		

Description/Soil Classification (Color, Texture, Structures)

easy drilling to 2' ; cuttings - clay, brown-green, sandy, w/ rocks (fill-like)

split spoon : clay, green-brown, stiff, minor sand, w/rocks, moist, no odor (2'-2'7"). 1" layer of sand (2'7"-2'8") poorly sorted, black, loose, moist, faint HC odor (2'8"-3') sand and rock fragments, loose, wet, black, tarry odor and sheen. split spoon 3'-4' ~4" slough, then sand, black, and rocks, loose, moist, no discernable o[dor]

4'-4'4" : clay, gray-green, sandy, soft, moist, no odor

4'4"-4'8" sand, fine, black, loose, moist, faint HC o[dor]

4'8"-5' sand, poorly sorted, loose, black, moist, no o[dor]

5'-5'4" sand and gravel, wet, runny, no odor

5'4"-5'8" sand, poorly sorted, moist, loose, faint tarry odor

6'-7' clay, gray, silty, soft, w/ gravel mixed in, moist tarry sheen and odor on outside (not throughout)

split spoon at 7' and at 8' : refusal (rubble) samples came up filled w/ very heavy tarry liquid, heaviest observed to date (pure product), floats on water. also metal sheeting fragments (drums?)

hard drilling @ ~9', then easy

shelby @ 10' : 10'-10'3" sand, medium, clayey, some rocks, soft, pliable, tarry odor 10'3"-12' Bay Mud (silt, clayey, green-gray, w/shell fragments, tarry outside, clean w/ H_2S odor inside

Environmental Resources Management **Drilling L**

Project: Yosemite / Fitch outfall Owner: S.F. Public Works Dept
Location: Armstrong & Hawes W.O. Number: 204
Well Number: OW-3 Total Depth: 12' Diameter: 10"
Surface Elevation: ~126' Water Level: Initial: – 24-hrs: 3.31' below grade
Screen: Dia.: 4" Length: 5' Slot Size: 0.020"
Casing: Dia.: 4" Length: 6.5' Type: PVC
Drilling Company: ENEXCO Drilling Method: hollow stem
Driller: B. Jarvis Log By: DC Date Drilled: 2-12-87

Sketch Map

(see p. 1)

Notes

Depth (Feet)	Graphic Log	Well Construction	Sample Number	Description/Soil Classification (Color, Texture, Structures)

Well Construction Details

8' - 12' (below grade): solid PVC, 4" dia.
3' - 8' (" "): wire wound PVC, 4" dia., 0.020" slot
0.5' - 3' (" "): solid PVC, 4" dia.

Lonestar #3 sand: 2.5' - 9'
bentonite (pellets) 9' - 12'
bentonite (granular) 1.5' - 2.5' (annular seal)
concrete 0.5 - 1.5 (surface seal)

well completed ~ 0.5' below grade; inner locking box (lock installed), outer utility box at grade

well development: ~55 gal of oil/water removed w/ guzzler pump 2/25/87

approx 1.0 - 1.5 ft of floating product in this well

APPENDIX C

REVISED RECOMMENDED HEALTH AND SAFETY PLAN
FOR THE SEWER LINE CONSTRUCTION PROJECT
CITY OF SAN FRANCISCO

REVISED RECOMMENDED HEALTH AND SAFETY PLAN
FOR THE SEWER LINE CONSTRUCTION PROJECT
CITY OF SAN FRANCISCO

July 1987

Prepared by:

Environmental Resources Management, Inc.
999 West Chester Pike
West Chester, PA 19382

Prepared for:

ERM-West, Inc.
2865 Sunrise Blvd.
Suite 105
Rancho Cordova, CA 95670

ERM H&S Coordinator

ERM-West Project Consultant

File No.: M-0001

EXECUTIVE SUMMARY

Environmental Resources Management, Inc., (ERM) has developed the following Health and Safety Plan for the Sewer Line Construction Project taking place within the City and County of San Francisco. The intent of this plan is to recommend appropriate Health and Safety procedure to be followed by site personnel during the field operations of this Project. Environmental Resources Management-West, Inc., (ERM-West) will provide consulting assistance to the City of San Francisco in implementing, as a minimum, protocols established herein throughout those applicable activities associated with the Sewer Line Construction Project.

The City of San Francisco may adopt health and safety policies and procedures set forth in this Plan; however, neither ERM nor ERM-West assumes liability regarding its implementation. This plan has been developed solely on the basis of information supplied to ERM which is contained in the Appendix A of the document.

SECTION 1

INTRODUCTION

This Health and Safety Plan has been developed by Environmental Resources Management, Inc., for the Yosemite and Fitch Sewer Line Construction Project taking place within the City of San Francisco. This plan will serve to provide recommended health and safety procedures for those employees who may be exposed to any hazardous compounds that may be present during the construction of the proposed sewer line. The procedures set forth in this plan are designed to reduce the risk of exposure to chemical substances which may be present in the soil, water and air associated with the sewer line construction.

The sewer line has been routed through two areas that may pose a threat to the health and safety of those workers directly involved with the construction activities. One section of the sewer line is designated to run in near proximity to a former drum crushing and disposal facility (now a Superfund site). The soils and ground water in this area have been determined to contain high concentrations of vinyl chloride and dieldrin. Another section of the sewer line will run through an area with a variety of polynuclear aromatic hydrocarbons and creosote compounds in the soil and groundwater.

1.1 Risk Assessment - Potential Chemical Exposure

A detailed risk assessment has been developed to support the recommendations set forth in this Plan (Appendix A). A concise summary of the risk assessment based on compound exposure is provided in Table 1-1.

1.2 Risk Assessment - Physical Hazards

The construction of the City of San Francisco sewer line poses several potential physical hazards to those workers directly involved with the construction activities. The Homer J. Olsen Construction Company shall be responsible for implementing feasible engineering controls and safe work practices related to its function as contractor to the City of San Francisco in compliance with appropriate state and federal regulations (California OSHA specifically addresses trenching, shoring, utilities, and confined space entry practices within its regulations). Such controls and work practices will greatly reduce the threat of physical injury due to the inherent hazards present at the site.

Physical hazards associated with the site include the presence of heavy machinery, working in trenches which may be considered confined space, working along active thoroughfares, and the presence of construction materials and refuse. Such inherent hazards pose the threat of physical injury to site personnel and must be considered in the Health and Safety Plan.

TABLE 1-1

IDENTIFICATION AND ASSESSMENT OF POTENTIAL CHEMICAL HAZARDS

COMPOUND	REL, TLV, OR PEL*	ODOR THRESHOLD	ROUTE OF EXPOSURE	SYMPTOMS OF ACUTE EXPOSURE
Creosote	0.1 mg/m^3	-	Skin Absorption	(1)
Diesel Fuel	-	.01 - .08 ppm	Inhalation, Absorption	(1)
Poly Aromatic Hydrocarbons (based on benzo(a) pyrene	0.2 mg/m^3	4.68 (benzene)	Inhalation, Absorption, Ingestion	NA
Trimethyl benzene	25 ppm	0.027 ppm	Inhalation, Absorption, Ingestion, Direct Contact	(1) (2)
Dieldrin	0.25 mg/m^3	0.041 ppm	Inhalation, Absorption, Ingestion, Contact	(2) (4)
Vinyl Chloride	1 ppm	260 ppm	Inhalation, Possible Absorption	(1) (3)
trans-1,2-Dichloroethene	200 ppm	0.085-500 ppm	Inhalation, Ingestion Contact	(1) (4)

(1) Eye, Nose, Throat, Skin Irritation
(2) Headache, Fatigue, Nausea
(3) Lightheaded, Some Nausea, Dull Visual and Audio Response
(4) Central Nervous System Disorder, Convulsions, Sweating

* REL - Recommended Exposure Limit (NIOSH)
PEL - Permissible Exposure Limit (OSHA - US or California)
TLV - Threshold Limit Value (ACGIH)

1.3 Applicable Regulations

Federal and state agencies have established standards and guidelines addressing worker protection and safe work practices.

These regulations may or will impact the manner in which the Sewer Line Construction operations are conducted. Table 1-2 summarizes the key regulations that must be considered and/or followed during the Sewer Line Construction Project.

TABLE 1-2

APPLICABLE STANDARDS

AGENCY	STANDARD REFERENCE	SUBJECT OF REGULATION
U.S. Dept. of OSHA	1910.20	Recordkeeping
U.S. Dept. of OSHA	1910.134	Respiratory Protection
U.S. Dept. of OSHA	1910.151	Medical Facilities
U.S. Dept. of OSHA	1910.120	Worker Protection of Hazardous Waste Sites
U.S. Dept. of OSHA	1926	Construction Activities
California OSHA	--	Trenching, Shoring, Utilities, Rigth-to-Know, Permissible Exposure Limits

SECTION 2

PROJECT ORGANIZATION AND RESPONSIBILITIES

The following responsibilities have been or will be assigned to designated personnel for the duration of the San Francisco Sewer Line Construction Project.

2.1 ERM-West Site Consultant

Person duly appointed by ERM to act in a supervisory capacity in all matters relating to the role of ERM with respect to the Sewer Line Construction Project. The Site Consultant for this investigation will be Mr. Daniel Hinrichs.

2.2 ERM-West Operations Consultant

Person duly appointed by ERM to conduct those activities specific to the function of ERM with respect to the Sewer Line Construction Project. The ERM Operations Consultant for this Project will be Mr. Dan Cutugno.

2.3 Site Operations Manager

Person duly appointed by the City of San Francisco to act in a supervisory capacity and shall be in charge of all matters related to the field operations of this Project. That person is Mr. Steve Mullinnix. ERM-West Site and Operations Consultants shall respond to and provide consultation to the Site Operations Manager with respect to any and all operations at the site.

2.4 Site Safety Officer

Person duly appointed by the City of San Francisco and having:

- responsibility for the field implementation, evaluation, and any necessary field modifications of this Health and Safety Plan;

- responsibility for maintaining adequate supplies of all personal protective equipment as well as calibration and maintenance of all monitoring instruments.

- authority to suspend work during the Sewer Line Construction due to any ineffectiveness of this Health and Safety Plan.

SECTION 3

PERSONNEL TRAINING REQUIREMENTS

3.1 Personnel Training

Site personnel associated with those field activities in which the potential for exposure to hazardous substances exists may be required to participate in a health and safety training program that complies with existing U.S. Department of OSHA regulations 29 CFR 1910.120. This program must instruct employees on general health and safety principles and procedures, proper operation of monitoring instruments, and use of personal protective equipment.

In addition, site employees must undergo site-specific training prior to the start-up of any given project or task. As activities change at a particular site, related training must be provided as necessary. The site-specific training must address potential hazards and associated risks, site operating procedures and safe working practices, decontamination procedures, emergency response and site control methods to be employed. A Site-Specific Health and Safety Plan such as this must be developed and provided to all personnel involved in pertinent field activities.

Additional, specialized training must also be provided as dictated by the nature of site activities. Specialized training must be provided for activities such as confined space entry, excavations and handling of unidentified substances. Employees involved in these types of activities shall be given off-site instruction regarding the potential hazards involved, and with site activities and the appropriate health and safety procedures to be followed.

These training requirements may apply to the Sewer Line Construction Project should any State or Federal agency mandate site remediation due to the potential compounds present. All site personnel involved in the City Sewer Line Construction field activities shall have received the required basic training discussed above where applicable. Exhibit 3-1 will be used to document site personnel as meeting the training requirements specified in 29 CFR 1910.120. The appropriate Health and Safety Plan shall be distributed to all necessary personnel and discussed in detail prior to the start of field activities. Specialty training shall be provided as determined by task and responsibility. All training of personnel will be conducted under direct supervision of a trained Health and Safety officer.

EXHIBIT 3-1

SUBCONTRACTOR OCCUPATIONAL SAFETY AND HEALTH CERTIFICATION

PROJECT: ______________________________

CONTRACTOR: ____________________________

1. Contractor certifies that the following personnel to be employed on the Sewer Line Construction Project have met the following requirements of the OSHA Hazardous Waste Operations Standard (29 CFR 1910.120) and other applicable OSHA standards.

Contractor Personnel	Training	Respirator Certification	Medical Examination

2. Contractor certifies that it has received a copy of the Site Safety and Health Plan and will ensure that its employees are informed and will comply with its requirements.

3. Contractor further certifies that it has read and understands and will comply with all provisions of its contractual agreement with the City of San Francisco.

Signed ______________________________ Date ____________________

SECTION 4

SITE MONITORING AND
PERSONAL PROTECTIVE EQUIPMENT

4.1 Site Monitoring

Construction activities taking place within the Lumberyard area or Drum Crushing/Disposal area may create potentially hazardous conditions, such as the release of hazardous substances into the breathing space. These substances may be in the form of mists, vapors, dusts, or fumes that can enter the body through ingestion, inhalation, absorption and direct contact. Monitoring of these substances must be performed to ensure appropriate personal protective measures are employed during site activities.

Explosive environments may also be encountered during the course of any field investigation or project. It is anticipated that such conditions will not be present during any phase of the Sewer Line Construction activities. However, due to the confined nature of the construction activities, and the potential presence of flammable or explosive substances, monitoring for explosivity will be conducted as a precautionary measure to ensure site personnel are not subjected to any adverse environmental conditions.

The following describes the monitoring parameters to be evaluated during the City Sewer Line Construction Project. Recommended instruments to be used are also provided in the discussion. All instruments to be used during site activities must meet the established requirements set forth by OSHA, MSHA, NIOSH and state agencies where applicable. Action levels based on monitoring results are discussed in the following section.

<u>Organic Vapor Concentrations</u> - will be monitored periodically in the breathing space with an organic vapor meter. Organic vapor concentrations may be used as action level criteria for upgrading or downgrading protective equipment and implementing additional precautions or procedures. A backup organic vapor meter should be present throughout site activities in the event of an instrument malfunction.

<u>Explosivity</u> - will be monitored periodically in the breathing space. Measurements obtained from this instrument will be used as action level criteria for institution of additional precautions, site evacuation and protective equipment selection. An instrument capable of indicating the percentage of the lower explosive limit for substances present at the site should be utilized. Again, a backup or secondary meter is recommended during site activities.

<u>Radioactivity</u> - based on available information, it is not necessary to monitor for radioactivity during project activities.

All site monitoring will be conducted by or under the supervision of the Site Safety Officer. All readings obtained will be recorded in a dedicated site notebook by the Site Operations Manager. The Site Safety Officer will maintain all monitoring instruments throughout the site investigation to ensure their reliability and proper operation.

4.2 Action Levels

The following action levels have been established for activity cessation, site evacuation, emergency response, and the upgrade or downgrade in the level of personal protective equipment. Level C personal protective equipment as described in this Plan has been established as a minimum requirement during those activities taking place within the Lumberyard and Drum Crushing/Disposal areas.

Organic Vapors

A. Lumberyard Area

Site personnel shall don half or full face respirators equipped with appropriate cartridges should organic vapor concentrations reach or exceed 5 ppm in the breathing space. The use of a Draeger Pump with indicator tubes for naphthalene and benzene will then determine the absence or presence of hazardous vapors. A portable chromatograph may also be used to characterize site compounds. Verification of the presence of particular compounds, such as benzene, will require the Site Operations Manager to implement worker protection standards in compliance with California OSHA regulations. The established action level is based on one-half the TLV for naphthalene and benzene.

B. Drum Crushing/Disposal Area

Action levels based on organic vapors have been established at 0.5 ppm in the breathing space for the Drum Crushing/Disposal Area. Site personnel will don half or full face respirators should organic vapors exceed 0.5 ppm in the breathing space. Detector tubes will then determine the presence or absence of vinyl chloride at the site. Verification of the presence of vinyl chloride will require the Site Operations Manager to implement worker protection standards in compliance with California OSHA regulations. This action level is based on one-half the TLV for vinyl chloride as established by California OSHA.

The following action levels will apply to both the Lumberyard and Drum Crushing/Disposal Areas.

Explosivity

All site activity will cease wherever the lower explosive limit reaches or exceeds 20%. The site will then be evacuated of all personnel as quickly as possible. Fire officials will be informed of the situation so that effective measures can be taken to eliminate the risk of explosion. A lower explosive limit in the range of 10-20% will require the use of intrinsically safe instruments and equipment for all activity. Employees must use extreme caution under these conditions to avoid actions that may provide a source of ignition. Smoking and other activities that may provide a source of ignition will be prohibited in the site operations area to safeguard against the potential for explosion or fire.

4.3 Personal Protective Equipment

Personal protective equipment requirements must be established for the Sewer Line Construction Project based on the assessment of potential hazards identified in preceding reports and site characterization (Engineering controls shall also be implemented whenever possible to enhance worker protection throughout the investigation). All applicable state and federal regulations will be adhered to during the site operations regarding worker safety, engineering controls, and work practices.

Level C protection as described in this Plan will be required, at a minimum, for construction activities associated with the Lumberyard and Drum Crushing/Disposal areas. Some activities may require Level B protection as indicated by monitoring results and physical evaluation. The Site Safety Officer will determine whether or not a level of protection can be upgraded or downgraded. Changes in level of protection will be recorded in the dedicated site logbook along with an explanation as to why changes were made. Level D protection may be used for those activities that do not require direct contact with soils and/or other media associated with these areas. Level C protective equipment should be readily available at all times.

The types of equipment and clothing to be worn as part of the various levels of protection are as follows:

Level B Protection

a. Pressure demand cascade air system or other suitable self-contained, pressure demand breathing apparatus.

b. Chemical-resistant clothing such as Poly-coated Tyveks® or Saranex®. Suits will be one piece with booties and elastic wrist bands.

c. Outer nitrile and inner latex surgical gloves (both chemical resistant).

d. Leather boots with rubber overboots.

e. Chemical-resistant tape over protective clothing as necessary.

f. Options as required:

1. Coveralls
2. Disposable outer boots
3. Face shield
4. Escape mask as appropriate
5. Hard hat
6. Ear protection

Level C Protection

a. Full-face/half-face air purifying respirator equipped with appropriate organic vapor canisters or cartridges must be available (all personnel requiring respiratory protection are fit tested with the respirator to be used in the field). Dust pre-filters will be available and utilized as warranted by site conditions.

b. Chemical-resistant clothing such as Poly-coated Tyveks or Saranex®. Suits will be one piece with booties and elastic wrist bands.

c. Outer nitrile gloves at a minimum. Inner latex surgical gloves are also recommended where practical.

d. Leather boots with rubber overboots.

e. Options as required:

   1. Coveralls
   2. Disposable outer boots
   3. Escape mask
   4. Hard hat
   5. Face shield
   6. Ear protection
   7. Safety glasses
   8. Chemical-resistant tape

Level D Protection

a. Coveralls or long sleeve shirts.

b. Outer nitrile gloves at a minimum. Inner latex surgical gloves are recommended where pratical.

c. Leather boots with rubber overboots.

d. Options as required

   1. Disposable outer boots
   2. Hard hat
   3. Safety glasses
   4. Ear protection

SECTION 5

DECONTAMINATION

5.0 General

Personnel involved with the Sewer Line Construction activities may be exposed to compounds in a number of ways, despite the most stringent protective procedures. Site personnel may come in contact with vapors, gases, mists, or particulates in the air, or may be splashed by materials while performing site duties. Use of monitoring instruments and site equipment can also result in exposure to hazardous substances.

In general, decontamination involves scrubbing with an Alconox/water solution followed by clean water rinses. All disposable items shall be disposed of in a dry container. Certain parts of contaminated respirators, such as harness assemblies and leather or cloth components, are difficult to decontaminate. If grossly contaminated, they may have to be discarded. Rubber components can be soaked in soap and water and scrubbed with a brush. In addition to being decontaminated, all respirators, non-disposable protective clothing, and other personal articles must be sanitized before they can be used again if they become soiled from exhalation, body oils, and perspiration. The manufacturer's instructions should be followed in sanitizing the respirator masks. The Site Safety Officer will be responsible for the proper maintenance, decontamination, and sanitizing of all respirator equipment.

The decontamination zone layout and procedures should match the prescribed levels of personal protection. A detailed discussion for the establishment of the decontamination zone and the procedures required for the various levels of personnel protection follows.

Exclusion Zone (EZ). The site of activity, it is considered to be potentially contaminated. Appropriate personal protective equipment must be worn while in this zone. This zone is normally separated from the contaminant reduction zone by a 'hotline' or barrier to prevent personnel from entering the exclusion zone boundary without protective equipment. Ten feet from the point of operations will be considered the exclusion zone boundary for all potentially contaminated areas associated with the Sewer Line Construction Point.

Contaminant Reduction Zone (CRZ). It is within this zone that the decontamination process is undertaken. Personnel and their equipment must be adequately decontaminated before leaving this zone for the support zone.

Support Zone (SZ). The support zone is considered to be uncontaminated; as such, protective clothing and equipment are not required but should be available for use in emergencies. All equipment and materials are stored and maintained within this zone. Protective clothing is put on in the support zone before entering the contaminant reduction zone.

The nature of the Sewer Line Project is such that the establishment of a decontamination line may not be practical for all site employees. The following procedures have been established to provide site personnel with minimum guidelines for proper decontamination. These minimum procedures must be followed by personnel leaving the point of operations designated as the exclusion zone. The decontamination process shall be placed at a reasonable distance away from any area of potential contamination.

5.2 Decontamination Procedure

Personnel leaving the point of operations should wash outer gloves and boots whenever possible. At a minimum, the outer boots shall be removed first and stored in an appropriate area or properly disposed of. Personnel shall then remove and dispose of the Tyvek coveralls. Personnel should remove the Tyvek coveralls so that inner clothing does not come in contact with any contaminated surfaces. After Tyvek removal, personnel shall remove and discard outer nitrile gloves. Personnel shall then remove the respirator, where applicable. Respirators shall be disinfected between use with towelettes or other sanitizing methods. A wash station, at a minimum, will be present so that site personnel can thoroughly wash hands and face after leaving the point of operations. A portable shower unit may be necessary depending on prevalent site conditions or particular activities.

Portable wash stations shall be placed at several locations along the sewer line trench, for easy and efficient access. The wash station shall consist of a potable water supply, hand soap and clean towels. A portable sprayer unit filled with potable water should also be available to rinse off grossly contaminated boots, gloves and equipment. The Site Safety Officer will monitor decontamination procedures to ensure their effectiveness. Modifications of the decontamination procedure may be necessary as determined by the Site Safety Officer's observations.

SECTION 6

SITE CONTROL AND COMMUNICATIONS

6.0 Site Access

Access to the Sewer Line Construction activities will be limited to authorized personnel. Such personnel include ERM employees, designated Olsen equipment operators, and appropriate City of San Francisco officials. However, access into the established exclusion zone will be limited to those personnel wearing appropriate personal protective equipment. The exclusion zone will be cordoned off with flagging tape or other suitable indicators designating the exclusion zone boundary. The zone will also be monitored by the Site Safety Officer to ensure personnel do not enter without proper personal protection.

Sign-in procedures may be implemented to ensure only authorized personnel participate in the construction activities. The Site Operations Manager will coordinate this effort and maintain the generated documentation accordingly.

The Sewer Line Construction will, of course, involve the excavation of a trench several city blocks in length. Appropriate barricades must be located on either side of the excavated area to prevent passersby from entering the trench either purposely or accidentally. This procedure will allow for some degree of site control during those times the area is left unattended by site personnel (evenings, weekends, etc.). The barricade may consist of saw horses, dirt piles or other material that provides an effective barrier to the excavated zone.

SECTION 7

EMERGENCY RESPONSE

7.0 Emergency Response

In the event of an emergency, site personnel shall signal distress with three blasts from an appropriate horn (car horn, air horn, etc.). All appropriate authorities will then be immediately notified of the nature and extent of the emergency. Medical personnel will be informed of site hazards and activities prior to project initiation so that emergency situations can be handled most efficiently. Table 7-1 provides a list of important telephone numbers for use in necessary situations.

7.1 Responsibilities

The Site Safety Officer will be responsible for responding to all emergencies. The Site Safety Officer will:

1. Notify appropriate individuals and/or health care facilities of the activities and hazards of the investigation. Table 7-1 will be posted within the field office or any other visible location.

2. Ensure that the following safety equipment is available at the site: eyewash station, first aid supplies, and fire extinguishers.

TABLE 7-1

TELEPHONE NUMBER LIST

Affiliation (Name)	Telephone Number
ERM-West Site Consultant (Daniel Hinrichs)	(916) 635-7766
ERM-West Operations Consultant (Daniel Cutugno)	(415) 946-0455
Site Operations Manager (Steve Mullinnix)	(415) 648-6882
San Francisco City Official - Clean Water Program (Robert Collins)	(415) 648-6882
California Department of Health Services - Bay Area (Dwight Honig)	(415) 450-2043

Emergency

Police (San Francisco Police Dept.)	911
Fire (San Francisco Fire Dept.)	911
Ambulance	911
Hospital (San Francisco General Hospital)	(415) 821-8111

3. Have working knowledge of all safety equipment available at the site.

4. Ensure that a map which details the most direct route to the nearest hospital shall be prominently posted with the emergency telephone numbers.

7.2 Accidents and Injuries

In the event of a safety or health emergency at the site, appropriate emergency measures must immediately be taken to assist those who have been injured or exposed and to protect others from hazards. The Site Safety Officer will be immediately notified and will respond, depending on the seriousness of the injury. Personnel trained in First-Aid should be present during site activities to provide appropriate treatment of injuries or illnesses incurred during operations. CPR certified personnel must be present during those activities involving confined spaces as per California OSHA regulations.

7.3 Site Communications

Two-way radios will be used during the Sewer-Line Construction activities to facilitate field communications. Hand signals will be utilized where radios are impractical or unsafe. If possible, mobile phones will be present during construction activities for emergency response and office communications. Public telephones will be located prior to the start-up of activities as back up to the mobile phones or as the primary off-site communication network.

SECTION 8

SPECIAL PRECAUTIONS AND PROCEDURES

8.0 Potential Risks

The City Sewer Line Construction Project poses potential exposure risks to both chemical and physical hazards. The chemical risks have been explained in detail in the previous section. The potential for chemical exposure to hazardous substances has been greatly reduced through the use of personal protective clothing, engineering controls and implementation of safe work practices.

Other potential hazards that are associated with the Sewer Line Construction activities include injury from heavy equipment, heat stress, and confined space conditions. Precautionary measures have been established to reduce these risks to a minimum during site activities.

8.1 Confined Space Conditions

The construction of the City Sewer Line may create conditions that are considered confined or semi-confined work areas. Humidity, wind speed, wind direction, and other atmospheric conditions may affect the ventilation of the excavated trenches. Reduced ventilation can result in a build up of toxic or flammable vapors, or enable oxygen rich or deficient conditions to exist within the breathing space.

California OSHA has established specified requirements regarding confined space entry procedures. These regulations will dictate all activities that are considered to be within confined spaces as defined by the California OSHA standards. Site personnel may not enter any confined space area without the expressed written consent of the Site Operations Manager.

Confined or semi-confined space entry requires, at a minimum, continuous monitoring for organic vapors, atmospheric oxygen, and explosive conditions. Monitoring results will indicate whether the area can be entered safely, and if so, will determine the level of personal protection necessary for confined space activities. Five minute escape masks at a minimum must be readily available to all employees entering the confined or semi-confined space. Other precautions include the use of lifeline and life harness as determined by site conditions and activities.

8.2 Heat Stress

The timing of this project is such that heat stress may pose a threat to the safety of site personnel. Work/Rest regimens will be employed as necessary so that personnel do not suffer adverse effects from heat stress. Special clothing and an appropriate diet and fluid intake will be recommended to all site personnel to further reduce heat stress hazards.

8.3 Hazards Associated with Construction Activities

Inherent hazards exist due to the nature of the construction activities associated with the Sewer Line Project. The key hazards and associated precautions and procedures are provided below.

8.3.1 Trench Sloping and Shoring

The excavated trench will reach a depth of up to 30 feet in the Lumberyard area and approximately 25 feet in the Drum Crushing/Disposal area. It is essential that these trenches maintain slope stability and are properly shored with supporting structures. This is particularly critical in lieu of the bay muds that are likely to be encountered during excavation.

8.3.2 Heavy Machinery/Equipment

All site employees must remain aware of occurring site activity that involve the use of heavy equipment and machinery. Respiratory protection and protective eyewear may be worn frequently during site activities. This protective equipment significantly reduces peripheral vision of the wearer. Therefore, it is essential that all employees at the site exercise extreme caution during operation of equipment and machinery to avoid physically injury to themselves or others.

8.3.3 Construction Materials and Site Refuse

All construction materials and site refuse should be contained in appropriate areas or facilities. Site personnel should make certain that nails, lumber, cement etc. are not scattered throughout the area of activity and that all trash and scrap materials are immediately and properly disposed of.

8.3.4 Traffic

The sewer line construction will be located along active thoroughfares. Traffic cones and "Men Working" signs must be appropriately located along streets to divert motorists safely around the site activities. Florescent traffic vests must be worn by site personnel at all times as an added precaution.

8.4 Additional Safety Practices

The following are important safety precautions which will be enforced during this investigation:

1. Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases that probability of hand-to-mouth transfer and ingestion of material is prohibited in any area designated as contaminated.

2. Hands and face must be thoroughly washed upon leaving the work area and before eating, drinking, or any other activity.

3. Whenever decontamination procedures for outer garments are in effect, the entire body should be thoroughly washed as soon as possible after the protective garment is removed.

4. No excessive facial hair which interferes with the effectiveness of a respirator will be permitted on personnel required to wear respiratory protection equipment. The respirator must seal against the face so that the wearer receives air only through the air purifying cartridges attached to the respirator. Fit

testing shall be performed prior to respirator use to ensure a proper seal is obtained by the wearer.

5. Contact with potentially contaminated surfaces should be avoided whenever possible. One should not walk through puddles, mud, or other discolored surfaces; kneel on ground; lean, sit or place equipment on drums, containers, vehicles, or the ground.

6. Medicine and alcohol can potentiate the effect from exposure to certain compounds. Prescribed drugs and alcoholic beverages should not be consumed by personnel involved in the project.

7. Personnel and equipment in the work areas should be minimized, consistent with effective site operations.

8. Work areas for various operational activities should be established.

9. Procedures for leaving the work area must be planned and implemented prior to going to the site. Work areas and decontamination procedures must be established on the basis of prevailing site conditions.

10. Respirators will be issued for the exclusive use of one worker and will be cleaned and disinfected after each use.

11. Safety gloves and boots shall be taped to the disposable, chemical-protective suits as necessary.

12. All unsafe equipment left unattended will be identified by a "DANGER, DO NOT OPERATE" tag.

13. Noise mufflers or ear plugs may be required for all site personnel working around heavy equipment. This requirement will be at the discretion of the Site Safety Officer. Disposable, form-fitting plugs are preferred.

14. Cartridges for air-purifying respirators in use will be changed daily at a minimum.

APPENDIX A

RISK ASSESSMENT SUPPORTING THE RECOMMENDED HEALTH AND SAFETY PLAN FOR THE SEWER LINE CONSTRUCTION PROJECT CITY OF SAN FRANCISCO

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RISK ASSESSMENT SUPPORTING THE RECOMMENDED HEALTH AND SAFETY PLAN FOR THE SEWER LINE CONSTRUCTION PROJECT CITY OF SAN FRANCISCO

1.1 Risk Assessment of Contaminant Exposure

The following discussion summarizes the potential risks associated with worker exposure to those compounds that may be present during the City of San Francisco Sewer Lines Construction Project. This risk assessment will address the various routes of exposure associated with the substances involved. The results of this risk assessment provide the basis for the recommended health and safety procedures to be followed during project activities.

Table 1-1 is provided to summarize the potential compounds associated with the site and their corresponding Threshold Limit Value. The Threshold Limit Value (TLV) is defined as the airborne concentration of a substance with specific conditions under which it is believed most workers can be exposed to day after day without adverse effects. The TLV is expressed as a Time Weighted Average (TWA) and as a Short Term Exposure Limit (STEL). The TWA is based on acceptable concentrations a worker can be exposed to over an 8-hour day for a 40 hour work week. The Short Term Exposure Limit is defined as a 15 minute TWA exposure which should not be exceeded at any time during an 8-hour work day.

The Lumberyard compounds listed in Table 1-1 are present in varying concentrations as indicated by laboratory analysis of ground water samples at several locations on or near the site (see Appendix 3). Those compounds listed on Table 1-1 for the Drum Crushing/Disposal area were determined to be present in unknown concentrations through verbal communications with the California State Health Department (Mr. Dwight Honig).

Table 1-2 outlines the physical and chemical properties of the compounds of concern. Several properties which are included and are essential in determining the environmental fate and transport of these compounds are water solubility, octanol-water partition coefficients (K_{OW}), soil-water partition coefficients (K_{OC}), and Henry's Law Constants. Table 1-3 outlines the relative importance of aquatic processes influencing the fate of the compounds of concern. These processes assist in determining mobility of compounds in the environment.

1.1.1 Lumberyard Area

A. Environmental Fate and Transport

PNAs are a group of highly lipophilic chemicals that are ubiquitous in the environment. The sources and occurrence, including major sources of emissions, of PNAs have been reviewed and include the following:

- organic matter in combustion exhaust systems (automobiles);
- coal-fired residential stoves and kerosene heaters;
- intermediate sized coal-fired units and coal-fired plants;
- intermediate and smaller oil-fired and gas-fired units;
- incineration and open burning of wood products;
- asphalt production and use;
- fly ash production;

TABLE 1-1

POTENTIAL COMPOUNDS ASSOCIATED WITH THE CITY OF SAN FRANCISCO SEWER LINE CONSTRUCTION PROJECT

A. LUMBERYARD AREA

Compound	TLV-TWA	TLV-STEL
Creosote	0.1 mg/m^3	-
Diesel Fuel	-	-
Naphthalene	10 ppm	15 ppm
Acenaphthylene*	0.2 mg/m^3	-
Phenanthrene	0.2 mg/m^3	-
Fluoranthene*	0.2 mg/m^3	-
Acenaphthene	-	-
Fluorene*	0.2 mg/m^3	-
Anthracene*	0.2 mg/m^3	-
Pyrene	0.2 mg/m^3	-
Benzo(a)Anthracene*	0.2 mg/m^3	-
Chrysene*	0.2 mg/m^3	-
Benzo(k)Fluoranthene*	0.2 mg/m^3	-
Benzo(a)Pyrene*	0.2 mg/m^3	-
1,2,3 Trimethyl benzene 1,2,4 Trimethyl benzene 1,3,5 Trimethyl benzene	25 ppm (as trimethyl benzene)	35 ppm
Methyl ethyl benzene	-	-
Bis(2-ethylhexyl)phthalate	5 mg/m^3	-

* 0.2 mg/m^3 has been designated as the TLV for these Poly Nuclear Aromatics based on benzene solubles present in the compounds.

B. DRUM CRUSHING/DISPOSAL AREA

Compound	TLV-TWA	TLV-STEL
Dieldrin	0.25 mg/m^3 (skin)**	-
Vinyl chloride	5 ppm	-
trans-1,2-Dichloroethene	200 ppm	250 ppm

** (Skin) notation refers to the potential contribution to the overall exposure by the cutaneous route including mucous membranes and eye, either by airborne, or more particularly, by direct contact with the substance.

The ERM Group

- cigarette smoke (including cigars, pipes, and marijuana); and
- creosote production and usages.

Numerous studies have demonstrated the presence of many compounds of this class in cigarette smoke, air (industrial and ambient), water, food, soil, sediments, aquatic organisms, mineral oils and refined petroleum products such as gasoline, kerosene, and diesel fuel. PNAs have high melting points, are virtually insoluble in water and have low vapor pressures.

Sorption is the major fate process for PNAs as indicated by their K_{OC}s and several studies. PNAs rapidly sorb to soils and sediments (<90%) although sorption half-lives have not been determined. If in the soluble state in water, PNAs can volatilize with a half-life of 90 hours. The overall half-lives of PNAs in air and surface water are 5.5 days and 1-5 days, respectively. Photolysis of PNAs can occur under certain conditions ($t_{1/2}$ = 10-50 hours), but oxidation is very slow and hydrolysis does not occur in polynuclear aromatic hydrocarbons. The ultimate fate process for PNAs is biodegradation in soils and water. Numerous aquatic species and several soil microorganisms have been found which degrade PNAs. Bioaccumulation of PNAs is classified as a "short-term process" since the rapid accumulation is generally followed by metabolism and subsequent, excretion. Therefore, major fate processes include sorption and biodegradation; moderate processes are photolysis and volatilization; and oxidation, hydrolysis, and bioaccumulation are not considered as fate processes due to limited information.

The major transport process for PNAs in the environment is sorption on soils, sediments, and/or suspended particles followed by biodegradation.

Bis(2-ethylhexyl)phthalate (DEHP), a colorless, odorless oily liquid, is used in the manufacture of plasticizers and plastics. DEHP, one of the most commonly discharged priority pollutants, is insoluble in water, but soluble in mineral oils. Based upon its density and water solubility, excess DEHP will be a "sinker".

Sorption, biodegradation, and bioaccumulation of DEHP are competing fate processes in the environment. The predominant fate process depends upon the type of aquatic and soil environments present at a site. The available quantitative sorption data and K_{oc} for DEHP indicates that sorption to soils/sediments is a highly probable fate process. DEHP is a lipophilic compound which bioaccumulates in the aquatic food chain and also in higher mammals. This bioaccumulation is followed by metabolism and excretion, thus, biomagnification in the food chain is not likely. Bioconcentration factors range from 70 to 13,4000 times the water concentration. DEHP is readily biodegraded to the corresponding di-carboxylic acid ($t_{1/2}$ approximately 4 weeks). Limited information exists concerning the photolysis, hydrolysis (calculated $t_{1/2}$ = 2,000 years), oxidation, and volatilization of DEHP in the environment.

Environmental transport processes for DEHP include sorption to soils, sediments, and suspended particles, biodegradation, and bioaccumulation.

B. Toxicological Assessment

Because of many common features the polynuclear aromatic hydrocarbons, PNAs, are conveniently treated together. Several representatives of the class are strongly implicated in the proven association between smoking and lung cancer, between occupational exposure to coke-oven emissions, coal-tar, pitch, mineral oils and similar products and cancer of skin, lung, bladder and the gastro- intestinal tract. However, because exposure involves complex mixtures where, clearly, there is interaction between a number of initiators and promoters, it is more difficult to assess the activity of individual members of the group. Here, the relative potency exhibited in animal experiments - mainly skin application (alternatively subcutaneous or intramuscular injections) in mice - have been used as the only practical tool for the assessment of carcinogenicity. It should be pointed out, however, that the more active congeners do induce tumors at multiple sites. Several members of the group have shown to be genotoxic in a number of systems requiring metabolic activation.

Since the carcinogenic activity of PNAs are linked to the metabolic formation of reactive intermediates (e.g., dihydrodiol epoxides) of certain pathways, where the end effect depends on a delicate balance between activating and inactivating reactions, carcinogenicity is strongly dependent on species related metabolic differences. Many rodent species, like the mouse, are extremely sensitive to chemical carcinogens of this type, and experience from epidemiological investigations tends to demonstrate a much lower sensitivity of e.g. human skin than that of the mouse, a finding which has been corroborated by investigations in monkeys.

B.1 Benzo(a)pyrene (Coons et al. 1982)

B.1.1 Summary of Health Effects Data

Benzo(a)pyrene is a member of the polynuclear aromatic hydrocarbons (PNAs) which are persistent in the environment. The potential for PNAs to induce malignant transformation dominates the consideration of health hazards resulting from exposure, because there are often no overt signs of toxicity until the dose is high enough to produce a high tumor incidence. No case reports or epidemiological studies considering the significance of human exposure to individual PNAs are available. PNAs, administered by various routes, have been found to be carcinogenic in several animal species and to have local and systemic carcinogenic effects. Administered orally, carcinogenic PNAs produce tumors of the forestomach in mice. Lung tumors are produced in hamsters after intratrachial administration and in mice after intravenous administration. In skin painting experiments with mice, carcinogenic PNAs produce skin carcinomas. Other observed effects include production of local sarcomas and an increased incidence of lung adenomas in mice following single, subcutaneous injections. Studies in other species, while indicating that PNAs have universal carcinogenic effects, are less complete.

Carcinogenic PNAs are reported to be mutagenic in a variety of systems. The limited available information suggests that PNAs are not very potent teratogens or reproductive toxins. There is very little information regarding nonmalignant changes caused by exposure to PNAs. Application of carcinogenic PNAs to mouse skin is reported to cause deterioration of sebaceous glands, hyperplasia, hyperkeratosis and ulceration. Workers exposed to PAH-containing materials have exhibited chronic dermatitis, hyperkeratosis, and other skin disorders. Little information is available on the environmental toxicity of PNAs to wild life and domestic animals, in particular to aquatic organisms.

B.1.2 Pharmacokinetics and Metabolism

The primary exposure route for benzo(a)pyrene into the body is through inhalation from cigarette smoke. Once in the body, it is rapidly transported across the intestines and easily absorbed through the lungs. Although widely distributed to the tissues, benzo(a)pyrene is rapidly eliminated from the blood and liver, but accumulates in the body fat and fatty tissues. Benzo(a)pyrene requires metabolic activation by cyctochrome P-450 dependent microsomal-mixed-function-oxidase system in mammalian systems to become carcinogenic. The metabolites formed in the mammalian systems include benzo(a)pyrene-7,8-diol-9,10-oxide (ultimate carcinogenic derivative of benzo(a)pyrene), water-soluble glutathione, glucuronide and sulphate conjugates and organo-soluble metabolites, such as phenols, dihydrodiols, quinones, and labile epoxide intermediates. The excretion route in mice and rats for benzo(a)pyrene and its metabolites is the hepatobiliary system and feces. There is little evidence that extensive bioaccumulation occurs.

B.1.3 Toxic and Carcinogenic Studies

Benzo(a)pyrene is among the 54 chemicals evaluated by Carcinogen Assessment Group (CAG) of the EPA for relative carcinogenic potency as suspect human carcinogens. A level of evidence in animals indicates that sufficient studies have been conducted to determine the carcinogenicity of benzo(a)pyrene. However, inadequate studies have been conducted to determine the level of carcinogenic evidence in humans. Therefore, EPA has ranked benzo(a)pyrene as a B2 ("probable" human carcinogen) compound based on the level of evidence in animal studies. The CAG has determined a carcinogenic potency factor of 11.5 $(mg/kg/day)^{-1}$ for benzo(a)pyrene. A relative potency index of $3 \times 10^{+3}$ for benzo(a)pyrene places it among the more potent of the 54 suspect carcinogens and ranks it in the highest quatrile.

B.1.4 Applicable and Relevant Standards

The recognized applicable and relevant standards for benzo(a)pyrene are summarized in Table 1. Insufficient data exist to determine the water quality criteria for the protection of freshwater life. A Health Based Number from the EPA Office of Solid Waste has been established for benzo(a)pyrene at 3×10^{-9} ug/l. Regulations for work place exposure from OSHA and ACGIH have not been determined at this time. Benzo(a)pyrene is a "probable" human carcinogen and has unit concern risks of 10^{-5}, 10^{-6}, and 10^{-7} calculated by CAG to be 28, 2.8, 0.28 mg/L, respectively.

B.2 Naphthalene

B.2.1 Summary of Health Effects Data

Inhalation or ingestion of naphthalene may cause abdominal cramps, nausea, vomiting, diarrhea, headache, tiredness, confusion, painful urination, and bloody or dark urine. Swallowing large amounts may cause convulsions or coma. Inhalation, ingestion, and possibly skin absorption of naphthalene may cause destruction of red blood cells with anemia, fever, yellow jaundice, bloody urine, kidney and liver damage. Naphthalene, on contact with the eyes, has produced irritation. Naphthalene, on contact with the skin, has produced skin irritation. Repeated skin exposure to naphthalene may cause an allergic rash. Repeated eye exposure may cause cataracts.

B.2.2 Pharmacokinetics and Metabolism

Naphthalene can affect the body if it is inhaled, if it comes into contact with the eyes or skin, or if it is swallowed. It may enter the body through the skin. Naphthalene distributes

TABLE 1

SUMMARY OF TOXICOLOGICAL INFORMATION FOR
BENZO(A)PYRENE

Relevant Requirements, Criteria, Advisories or Guidance	Value
Health Based Number - EPA Office of Solid Waste	3×10^{-9} ug/L
EPA Water Quality Criteria	
fish and drinking water	2.8 ng/L
fish only	3.1 ng/L
protection of aquatic life	insufficient data
EPA Drinking Water Health Advisories	
1 day	none
10 days	none
chronic	none
OSHA 8 hr TWA	none
ACGIH 8 hr TWA	none
Noncarcinogenic effects	
risk characterization	
oral	
AIC	none
ADI	none
median effective dose	
oral	6.00×10^{-1} mg/day
inhalation	6.28×10^{0} mg/day
Carcinogenic effects	
Potency Factor (10^{-6} cancer risk)	
oral	$1.15 \times 10^{+1}$ (mg/kg/day)$^{-1}$
inhalation	6.10×10^{0} (mg/kg/day)$^{-1}$
10% effective dose	
oral	2.00×10^{-3} mg/kg/day
inhalation	2.00×10^{-3} mg/kg/day
Cancer Risk	
Inhalation at 1 ug/m^3 (risk)	3×10^{-3}
water (10^{-6} risk)	none
Classification, EPA	Group B2
Classification, IARC	Class 2B

throughout the tissues and organs of the body. The metabolism of naphthalene in mammalian systems has been studied extensively. Of importance is the metabolism of naphthalene to toxic metabolites which include 1- and 2-naphthol, 1,2-dihydroxynaphthalene, and 1,2-naphthoquinone. Once metabolized, liver biliary excretion and elimination through the feces is the major route through which naphthalene is removed from the body. No evidence for elimination of naphthalene and other PNAs via expired air exists in the literature.

B.2.3 Toxic and Carcinogenic Effects

Naphthalene vapor causes hemolysis and eye irritation; it may cause cataracts. Severe intoxication from ingestion of the solid results in characteristic manifestations of marked intravascular hemolysis and its consequences, including potentially fatal hyperkalemia. Initial symptoms include eye irritation, headache, confusion, excitement, malaise, profuse sweating, nausea, vomiting, abdominal pain, and irritation of the bladder; there may be progression to jaundice, hematuria, hemoglobinuria, renal tubular blockage, and acute renal shutdown. Hematologic features include red cell fragmentation, icterus, severe anemia with nucleated red cells, leukocytosis, and dramatic decreases in hemoglobin, hematocrit, and red cell count; sometimes there is formation of Heinz bodies and methemoglobin. Individuals with a deficiency of glucose-6-phosphate dehydrogenase in erythrocytes may be more susceptible to hemolysis by naphthalene. Cataracts and ocular irritation have been produced experimentally in animals and have been described in humans; of 21 workers exposed to high concentrations of fume or vapor for 5 years, 8 had peripheral lens opacities; in other studies no abnormalities of the eyes have been detected in workers exposed to naphthalene for several years. The vapor causes eye irritation at 15 ppm; eye contact with the solid may result in conjunctivitis, superficial injury to the cornea, chorioretinitis, scotoma, and diminished visual acuity. Naphthalene on the skin may cause hypersensitivity dermatitis; chronic dermatitis is rare.

B.2.4 Applicable and Relevant Standards

The applicable and relevant standards for naphthalene are limited to protection of aquatic life. The lowest reported toxic concentrations for acute and chronic exposure of freshwater organisms are 2.3 and 0.62 mg/L, respectively. Regulations for workplace exposure developed by OSHA and ACGIH for naphthalene are 10 ppm (50mg/m^3).

B.3 Bis(2-ethylhexyl)phthalate (Perwak et al. 1981)

B.3.1 Summary of Health Effects Data

Bis(2-ethylhexyl)phthalate is reported to be carcinogenic in rats and mice, causing increased incidence of hepatocellular carcinomas and neoplastic nodules after oral administration. The results of dominant lethal experiments in mice suggests that bis(2-ethylhexyl)phthalate is mutagenic when injected intraperitoneally. However, most experiments conducted with microorganisms and mammalian cells have failed to demonstrate genotoxic activity. Teratogenic and fetotoxic effects have been observed in experimental animals after oral and intraperitoneal administration. Other reproductive effects, including testicular changes in rats and mice, have also been reported. Bis(2-ethylhexyl)phthalate appears to have a relatively low toxicity in experimental animals. The oral, intraperitoneal, and intravenous LD_{50} values reported for bis(2-ethylhexyl)phthalate in rats are 31 g/kg, 30.7 g/kg, and 0.25 g/kg, respectively. Bis(2-ethylhexyl)phthalate is poorly absorbed through the skin and no irritant response or sensitizing potential from dermal application has been noted in experimental animals or humans. Chronic exposure to relatively high concentrations of bis(2-ethylhexyl)phthalate in the diet have caused retardation of growth and increased liver and kidney weights in experimental animals. Acute median effect values range from 1000 to 11100 ug/L of bis(2-ethylhexyl)phthalate for freshwater cladoceran Daphnia magna. LC_{50} values for the midge, scud, and bluegill all exceeded the highest concentrations tested, which were 1800, 3200, and 7700 ug/L, respectively.

B.2.2 Pharmacokinetics and Metabolism

The absorption route of bis(2-ethylhexyl)phthalate to the body is through oral exposure. The most common exposure route for this compound is through blood transfusions. Once in the blood, bis(2-ethylhexyl)phthalate can distribute to the various body organs and tissues and may accumulate in the fatty tissues or the body. Mammalian species can metabolize bis(2-ethylhexyl)-phthalate to mono-(2-ethylhexyl)phthalate and subsequently, its corresponding alcohol, ketone, and/or acid. Excretion from the body is through the urine and feces, usually within four to seven days in rodents. Of the absorbed bis(2-ethylhexyl)phthalate less than 3% exists as free phthalic acid.

B.2.3 Toxic and Carcinogenic Studies

Bis(2-ethylhexyl)phthalate is not among the 54 chemicals evaluated by the CAG for relative carcinogenic potency as potential human carcinogens. However, it has been investigated by the EPA Office of Research and Development, Environmental Criteria and Assessment Office in Cincinnati, Ohio. A level of evidence in animals indicates that sufficient studies have been conducted to determine the carcinogenicity of bis(2-ethylhexyl)-phthalate. However, inadequate studies have been conducted to determine the level of carcinogenic evidence in humans. EPA has ranked bis(2-ethylhexyl)phthalate as a class B2 or suspected human carcinogen. A carcinogenic potency factor of 2.0×10^{-4} $(mg/kg/day)^{-1}$ for bis(2-ethylhexyl)phthalate was calculated by tne EPA based on an effective dose 10%. This corresponds to a relative potency index of approximately 1×10^{-3} for bis (2-ethylhexyl)phthalate which would place it among the least potent of the suspected carcinogens.

B.2.4 Applicable and Relative Standards

The recognized applicable and relative standards for bis(2-ethylhexyl)phthalate are summarized in Table 2. The ambient water quality criterion for the protection of freshwater life is <940 ug/L. A Health Based number from the EPA Office of Solid Waste has been established at 2000 ug/L for bis(2-ethylhexyl)phthalate. Regulations for work place exposure are 5 mg/m^3 for both OSHA and ACGIH. The CAG has evaluated bis(2-ethylhexyl)phthalate as to its human carcinogenicity (Class B2). The relative carcinogenic potency for bis(2-ethylhexyl)phthalate has been calculated at 1×10^{-3} based upon an effective dose 10%.

1.1.2 Drum Crushing/Disposal Area

A. Environmental Fate and Transport

Dieldrin, a brown crystalline solid, has its current uses as an insecticide and fumigant. Classified as a pesticide on the Hazardous Substance List, dieldrin has a high volatility rate with a relatively low water solubility. Dieldrin is also a degradation product of aldrin in both atomspheric and aquatic reactions.

TABLE 2

SUMMARY OF TOXICOLOGICAL INFORMATION FOR BIS(2-ETHYLHEXYL)PHTHALATE

Relevant Requirements, Criteria, Advisories or Guidance	Value
Health Based Number - EPA Office of Solid Waste	2000 ug/L
EPA Regulatory Standard	700 ug/L
EPA Water Quality Criteria	
fish and drinking water	15000 ug/L
fish only	50000 ug/L
protection of aquatic life	<940 ug/L
EPA Drinking Water Health Advisories	
1 day	none
10 days	none
chronic	none
Carcinogenic Potency Factor unit risk at (10^{-6})	2.0×10^{-4} (mg/kg/day)$^{-1}$
OSHA 8 hr TWA	5 mg/m^3
ACGIH 8 hr TWA	5 mg/m^3
Noncarcinogenic effects	
risk characterization	
oral	
AIC	none
ADI	0.6 mg/kg/day
median effective dose	
oral	none
inhalation	none
Carcinogenic effects	
Potency Factor (10^{-6} cancer risk)	2.0×10^{-4} (mg/kg/day)$^{-1}$
oral	2.0×10^{-4} (mg/kg/day)$^{-1}$
inhalation	none
10% effective dose	
oral	none
inhalation	none
Cancer Risk	
Inhalation at 1 ug/m^3 (risk)	none
water (10^{-6} risk)	none
Classification, EPA	not classified
Classification, IARC	not classified

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Fate processes for dieldrin in the environment include biotransformation, volatilization, bioaccumulation, and sorption. Limited laboratory investigations indicate that biotransformation of dieldrin is feasibly possible in some biological systems. Volatilization of dieldrin from aquatic systems is an important process with half-lives on the order of a few hours to a few days. Once in the atmosphere, photooxidation processes are important in the formation of dieldrin from aldrin. However, data are currently not available to access the half-lives for the oxidation processes and aquatic environments. The results of terrestrial-aquatic microcosm experiments on the bioaccumulation of dieldrin in the environment indicate that bioconcentration factors in aquatic systems are approximately 10^3 to 10^4. Photolysis, oxidation and hydrolysis are considered of minor environmental significance for dieldrin due to the lack of quantifiable information.

The environmental transport processes for dieldrin include sorption to soils/sediments and/or suspended particles and volatilization from soils or surface water (or both) to the atmosphere.

Vinyl chloride is a starting material in the manufacture of PVC and other copolymers. It has an intermediate water solubility, but is an extremely volatile unsaturated aliphatic hydrocarbon. Based upon its density, vinyl chloride will be a "floater" if its water solubility were exceeded.

Volatilization is the predominant fate process for vinyl chloride in the environment. The laboratory volatilization half-life of vinyl chloride from water is 26 minutes while the overall half-lives in air and surface water are 1 day and 1-5 days, respectively. Once in the troposphere, vinyl chloride reacts rapidly ($t_{1/2}$ = few hours) to form hydrogen chloride (HCl) and formyl chloride (HCOCl) and, subsequently, carbon monoxide and hydrogen chloride ($t_{1/2}$ = 20 minutes). Studies indicate that volatilization proceeds so rapidly that the slower fate processes (photolysis, hydrolysis, and bioaccumulation) can not occur. Sorption and biodegradation studies show minimal evidence that the processes occur for vinyl chloride.

The predominant transport process for vinyl chloride from soils and water to the atmosphere is volatilization followed by oxidation in the troposphere.

Trans-1,2-dichloroethene is a colorless liquid with a characteristic ethereal odor. It has a moderate water solubility and is a volatile unsaturated aliphatic hydrocarbon. The uses of trans-1,2-dichloroethene include solvent for fats, decaffeinator, refrigerant, constituent of perfumes, and use in organic synthesis and medicine. Based upon its density any trans-1,2-dichloroethene in excess of its water solubility would be a "sinker" in a water column.

Volatilization is the major transport process for removal of trans-1,2-dichloroethene from aquatic systems. Once in the atmosphere, oxidation is the predominant fate process with hydroxyl radicals attacking the double bond producing formic acid, hydrochloric acid, and carbon monoxide. The atmospheric half-life of trans-1,2-dichloroethene is less than one day. Hydrolysis, photolysis, sorption, bioaccumulation, and biodegradation are considered of minor environmental significance for trans-1,2-dichloroethene due to a lack of quantifiable information.

The predominant transport process for trans-1,2-dichloroethene from soils and water to the atmosphere is volatilization followed by oxidation in the atmosphere.

B. Toxicological Assessment

B.1 Dieldrin

B.1.1 Summary of Health Effects Data

Both aldrin and dieldrin are carcinogens causing increases in a variety of tumors in rats at low but not at high doses and producing a higher incidence of liver tumors in mice. The reason for this reversed dose-response relationship is unclear. Neither appears to be mutagenic when tested in a number of systems. Aldrin and dieldrin are both toxic to the reproductive system and teratogenic. Reproductive effects include decreased fertility, increased fetal death, and effects on gestation; while teratogenic effects include cleft palate, webbed foot, and skeletal anomalies. Chronic effects attributed to aldrin and dieldrin include liver toxicity and central nervous system abnormalities. Both chemicals are acutely toxic; the oral LD_{50} is around 50 mg/kg, and the dermal LD_{50} is about 100 mg/kg.

B.1.2 Pharmacokinetics and Metabolism

Dieldrin is readily absorbed through the skin and gastrointestinal tract, and by the respiratory tract following inhalation exposure. Dieldrin is distributed throughout the body and preferentially absorbs to lipophilic tissues and organs of the body, including adipose tissue and liver. Highly chlorinated hydrocarbons that are relatively resistant to metabolism (such as PCBs, DDT, or dieldrin) tend to be stored in fatty tissues for long periods of time (half-lives greater than 100 days). Elimination of unabsorbed dieldrin could be via expired air, feces, or urine.

B.1.3 Toxic and Carcinogenic Effects

Dieldrin has tested positive in carcinogenicity, mutagenicity, and teratogenicity studies. Dieldrin is among the 54 chemicals evaluated by CAG for relative carcinogenic potency as suspect human carcinogens. A level of evidence in animals indicates that sufficient studies have been conducted to determine the carcinogenicity of dieldrin. However, inadequate studies have been conducted to determine the level of carcinogenic evidence in humans. Therefore, EPA has ranked dieldrin as a Bs ("probable" human carcinogen) compound based on the level of evidence in animal studies. IARC has classified dieldrin as a Group 2B carcinogen based upon the same levels of evidence.

B.1.4 Applicable and Relevant Standards

The recognized applicable and relevant standards for dieldrin are summarized in Table 3. The water quality criterion for the protection of fresh water aquatic life is 2.5×10^{-3} mg/L. No regulatory standards such as MCls have been established by the EPA, but the World Health Organization has set a 3×10^{-5} mg/L level for drinking water. Regulations for workplace exposure from OSHA and ACGIH have been established at 0.25 mg/m^3. Dieldrin is a suspected human carcinogen for which the CAG has unit risks of 10^{-5}, 10^{-6}, and 10^{-7} calculated to be 0.71, 0.071, and 0.0071 mg/L, respectively.

B.2 Vinyl Chloride (Klaassen, et al. 1986)

Vinyl chloride is a human carcinogen that causes angiosarcomas of the liver and tumors of the brain, lung, and hemolymphopoietic system. There is suggested evidence that vinyl chloride has teratogenic and reproductive effects in both humans and animals.

TABLE 3

SUMMARY OF TOXICOLOGICAL INFORMATION
FOR DIELDRIN

Relevant Requirements, Criteria, Advisories or Guidance	Value (mg/L)
World Health Organization	3×10^{-5}
EPA Water Quality Criteria	
fish and drinking water	7.1×10^{-8}
fish only	7.6×10^{-8}
protection of aquatic life	2.5×10^{-3}
EPA Drinking Water Health Advisories	
1 day	none
10 days	none
chronic	none
Carcinogenic Potency Factor unit risk at (10^{-6})	30.4 $(mg/kg/day)^{-1}$
OSHA 8 hr TWA	0.25 mg/m^3
ACGIH 8 hr TWA	0.25 mg/m^3
Noncarcinogenic effects	
risk characterization	
oral	
AIC	none
ADI	none
median effective dose	
oral	none
inhalation	none
Carcinogenic effects	
Potency Factor (10^{-6} cancer risk)	
oral	30.4 $(mg/kg/day)^{-1}$
inhalation	none
10% effective dose	
oral	7.81×10^{-3} mg/kg/day
inhalation	7.81×10^{-3} mg/kg/day
Cancer Risk	
Inhalation at 1 ug/m^3 (risk)	none
water (10^{-6} risk)	0.71 ng/L
Classification, EPA	B2
Classification, IARC	2B

Chronic human exposure to vinyl chloride is associated multiple stemic disorders, including a sclerotic syndrome, acro-osteolysis, and liver damage. Acute human exposure to high concentrations can cause narcosis, respiratory tract irritation, bronchitis, and memory disturbances. Chronic exposure by animals can result in lesions of the liver, kidney, spleen, and lungs. Concentrations encountered by workers in industries using or producing vinyl chloride are reportedly quite variable and may range from less than the limit of detection to several grams per cubic meter. Acute inhalation exposure from experimental animals to high levels of vinyl chloride can result in narcosis or death. The 2-hour LC_{50} value for rats is 390 g/m^3. Chronic exposure of experimental animals can result in growth disturbances and has histopathological and histochemical lesions in the liver, kidney, spleen, and lungs.

B.2.2 Pharmacokinetics and Metabolism

Vinyl chloride is readily absorbed by inhalation or from the gastrointestinal tract when dissolved in a suitable carrier, and the substance is rapidly distributed throughout the organism. Part of the absorbed dose is excreted unchanged via expired air but the substance is also metabolized via epoxidation to various polar end products which are excreted in the urine.

B.2.3 Toxic and Carcinogenic Effects

The acute toxicity of vinyl chloride is low, and short-term human exposure to high concentrations mainly causes depression of the central nervous system. Chronic exposure to vinyl chloride has been associated with multiple systemic disorders involving sclerodermatous skin damage, acro-osteolysis, Raynaud's phenomenon, as well as hepatic and renal damage. There is also evidence in experimental animals as well as in humans suggesting that vinyl chloride has teratogenic as well as toxic effects on reproduction.

Vinyl chloride causes tumors at multiple sites (liver, lung, brain, kidney) in experimental animals (mice, rats and hamsters) after oral administration or upon inhalation. In man exposure has been associated with angiosarcomas of the liver, tumors of brain, lung and of the maematopoietic and lymphatic systems.

Reports of increased incidences of tumors of the digestive system, urinary tract and breast have been judged inadequate by IARC to evaluate the carcinogenicity of vinyl chloride for these sites. The substance has been found to be genotoxic in several short-term tests.

As previously mentioned, EPA as well as IARC have classified vinyl chloride as a human carcinogen. The Carcinogen Assessment Group of EPA has determined a carcinogenicity potency factor of about 2×10^{-2} $(mg/kg/day)^{-1}$ for this carcinogen which places it among the least potent of the 54 potential carcinogens evaluated by CAG and ranks it in the lowest quatrile.

B.2.4 Applicable and Relevant Standards

The recognized applicable and relevant standards for vinyl chloride are summarized in Table 4. Insufficient data exists to determine the ambient water quality criterion for the protection of fresh water life. An MCL (maximum concentration limit in drinking water) has been established at 1 ug/L for vinyl chloride. Regulations for the work place exposure are 65 ppm (130 mg/m^3) for OSHA and 5 ppm (10 mg/m^3) for ACGIH. Vinyl chloride is a known human carcinogen and the CAG has calculated lifetime risks at 20, 2.0 and 0.2 ug/L (drinking water), for 10^{-5}, 10^{-6}, 10^{-7}, respectively.

TABLE 4

SUMMARY OF TOXICOLOGICAL INFORMATION FOR
VINYL CHLORIDE

Relevant Requirements, Criteria, Advisories or Guidance	Value	
EPA MCL (proposed)	1 ug/L	
EPA Water Quality Criteria		
fish and drinking water	2.0 ug/L	
fish only	525 ug/L	
protection of aquatic life	insufficient data	
EPA Drinking Water Health Advisories	10 kg	70 kg
1 day	2600 ug/L	—
10 days	2600 ug/L	—
chronic	13 ug/L	46 ug/L
OSHA 8 hr TWA	65 ppm (130 mg/m^3)	
ACGIH 8 hr TWA	5 ppm (10 mg/m^3)	
Noncarcinogenic effects		
risk characterization		
oral	none	
AIC	none	
ADI (adjusted for drinking water exposure)	2×10^{-3} mg/kg/day	
median effective dose		
oral	$2.28 \times 10^{+2}$ mg/day	
inhalation	$6.28 \times 10^{+2}$ mg/day	
Carcinogenic effects		
Potency Factor (10^{-6} cancer risk)	1.75×10^{-2} $(mg/kg/day)^{-1}$	
oral	2.30 $(mg/kg/day)^{-1}$	
inhalation	2.50×10^{-2} $(mg/kg/day)^{-1}$	
10% effective dose		
oral	6.25 mg/kg/day	
inhalation	6.25 mg/kg/day	
Cancer Risk		
Inhalation at 1 ug/m^3 (risk)	3×10^{-6}	
water (10^{-6} risk)	1.5×10^{-2} ug/L	
Classification, EPA	Human carcinogen (Group A)	
Classification, IARC	Human carcinogen (Group 1)	

B.3 Trans-1,2-dichloroethene

B.3.1 Summary of Health Effects Data

1,2-Dichloroethene vapor is a narcotic and a mucous-membrane irritant. Variations in toxicity of the cis- as compared with the trans-form have been reported. A concentration of 39,000 ppm was lethal to guinea pigs, and narcosis was produced at 18,000 ppm. Dogs exposed to high concentrations of vapor developed superficial corneal turbidity which was reversible. No effects were observed in several species with repeated exposure for up to 6 months at 1000 ppm. It has been used as a general anesthetic in man; one industrial fatality was due to very high vapor inhalation in a small enclosure.

B.3.2 Pharmacokinetics and Metabolism

Trans-1,2-dichloroethene is a low molecular weight, lipid soluble material which should be absorbed quickly following dermal, ingestion, or inhalation exposures. Kinetic data for tissue distribution is not available at this time. However, absorption and distribution may follow that of 1,1-dichloroethene where the highest concentrations were detected in the liver and kidney. The metabolic end products of chlorinated ethenes are predominately alcohols and carboxylic acids. Trans-1,2-dichloroethene was transformed to 2,2-dichloroethanol and 2,2-dichloroacetic acid in rat liver microsomal preparations. The excretion of trans-1,2-dichloroethene and its metabolites from the body are expected to be rapid and similar to that of 1,1-dichloroethene.

B.3.3 Toxic and Carcinogenic Effects

The dichloroethenes, like other chlorinated ethenes, possess anesthetic properties at high concentrations. The trans-isomer appears to be twice as potent as the cis-isomer. The oral LD_{50} in the rat was 1300 mg/kg. When administered intraperitoneally, the LD_{50} increased six-fold to 7800 mg/kg. At high exposure levels, narcotic and anesthetic effects are observed. The liver and kidneys are expected to be the principal targets following exposure to lower but acutely toxic doses. Long-term exposure of Wistar rats to air at 0, 200, 1000, or 2000 ppm were studied. Slight degeneration of liver cells was seen at 200 ppm. No data are currently available on the teratogenic effects of trans-1,2-dichloroethene exposure. Mutagenicity tests on trans-1,2-dichloroethene were negative.

Both EPA and IARC have classified trans-1,2-dichloroethene as a noncarcinogen.

B.3.4 Applicable and Relevant Standards

The recognized applicable and relevant standards for trans-1,2-dichloroethene are summarized in Table 5. The water quality criterion for the protection of freshwater aquatic life is 11.6 mg/L. A MCLG of 0.07 mg/L has been proposed for trans-1,2-dichloroethene in drinking water. Regulations for workplace exposures from OSHA and ACGIH have been established at 790 mg/m^3. As previously stated, EPA and IARC consider trans-1,2-dichloroethene as a noncarcinogen at this time.

1.2 Associated Physical Hazards

The construction of the City of San Francisco sewer line poses several physical hazards to those workers directly involved with the construction activities. The Hummer J. Olsen Construction Company is deemed responsible for implementing feasible engineering controls and safe work practices related to its function as contractor to the City of San Francisco in compliance with appropriate state and federal regulations. California OSHA specifically addresses trenching, shoring, utilities, and confined space entry practices within its regulations. Such controls and work practices will greatly reduce the threat of physical injury due to the inherent hazards present at the site.

TABLE 5

SUMMARY OF TOXICOLOGICAL INFORMATION
FOR TRANS-1,2-DICHLOROETHENE

Relevant Requirements, Criteria, Advisories or Guidance	Value (mg/L)	
MCLG (proposed)	0.07	
EPA Water Quality Criteria		
fish and drinking water	-	
fish only	-	
protection of aquatic life	11.6	
EPA Drinking Water Health Advisories	10 kg	70 kg
1 day	2.72	-
10 days	1.0	-
chronic	1.0	3.5
OSHA 8 hr TWA	790 mg/m^3	
ACGIH 8 hr TWA	790 mg/m^3	
Noncarcinogenic effects		
risk characterization		
oral		
AIC	none	
ADI	none	
median effective dose		
oral	1.89×10^2 mg/day	
inhalation	1.89×10^2 mg/day	
Carcinogenic effects		
Potency Factor (10^{-6} cancer risk)		
oral	none	
inhalation	none	
10% effective dose		
oral	none	
inhalation	none	
Cancer Risk		
Inhalation at 1 ug/m^3 (risk)	none	
water (10^{-6} risk)	none	
Classification, EPA	NC	
Classification, IARC	3	

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APPENDIX B

LABORATORY ANALYSIS

Anlab
ANALYTICAL LABORATORY
A DIVISION OF DEMANTE & STOWELL

1914 S STREET SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

March 9, 1987
Date Sampled: 2/11/87 & 2/13/87
Date Sample Received: 2/17/87
Report # 112075

ERM-WEST
1777 Botelho Drive, Suite 260
Walnut Creek, CA 94596-5022

ATTN: Dan Cutugno

Job #204

Sample Description/ Anlab ID #	Total Petroleum Hydrocarbons By EPA #8015 Modified. mg/kg*	FLASHPOINT
OW-1 8.5 ft. ID #112075-1	460	
OW-2 - 3'6"-3'10" ID #112075-2	1,400	
OW-3 ID #112075-3	470,000	**
OW-3 ID #112075-4	Diesel type components.	

*Based on diesel.
**Flashpoint to follow.

Data Certified By [signature]

Report Approved By Roger Elliott

Anlab
ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

EPA 610
POLYAROMATIC HYDROCARBONS

CLIENT: ERM-WEST - Dan Cutugno REPORT # 112075 PAGE 4

SAMPLE DESCRIPTION: OW-3 ANLAB ID# 112075-3

STORET	COMPOUND	CONCENTRATION, mg/kg
34696	NAPTHALENE	48,000
34200	ACENAPHTHYLENE	5,400
34205	ACENAPTHENE	<2,000
34381	FLUORENE	<2,000
34461	PHENANTHRENE	11,000
34220	ANTHRACENE	<2,000
34376	FLUORANTHENE	4,100
34469	PYRENE	<2,000
34526	BENZO(A) ANTHRACENE	<2,000
34320	CHRYSENE	<2,000
34230	BENZO(B) FLUORANTHENE	<2,000
34242	BENZO(K) FLUORANTHENE	<2,000
34247	BENZO(A) PYRENE	<2,000
34556	DIBENZO(A,H) ANTHRACENE	<2,000
34521	BENZO(GHI) PERYLENE	<2,000
34403	INDENO(1,2,3-CD)PYRENE	<2,000

NOTE: ALL RESULTS CONFIRMED BY GC/MS.

DATA CERT. BY ______ REPORT APPROV. BY ______

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EPA 610
POLYAROMATIC HYDROCARBONS

CLIENT: ERM-WEST - Dan Cutugno REPORT # 112075 PAGE 3

SAMPLE DESCRIPTION: DK-2 - 3'6"-3'10" ANLAB ID# 112075-2

STORET	COMPOUND	CONCENTRATION, mg/kg
34696	NAPTHALENE	180
34200	ACENAPHTHYLENE	<10
34205	ACENAPTHENE	28
34381	FLUORENE	17
34461	PHENANTHRENE	88
34220	ANTHRACENE	25
34376	FLUORANTHENE	33
34469	PYRENE	81
34526	BENZO(A) ANTHRACENE	<10
34320	CHRYSENE	<10
34230	BENZO(B) FLUORANTHENE	<10
34242	BENZO(K) FLUORANTHENE	<10
34247	BENZO(A) PYRENE	<10
34556	DIBENZO(A,H) ANTHRACENE	<10
34521	BENZO(GHI) PERYLENE	<10
34403	INDENO(1,2,3-CD)PYRENE	<10

NOTE: ALL RESULTS CONFIRMED BY GC/MS.

DATA CERT. BY ______ REPORT APPROV. BY ______

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EPA 610
POLYAROMATIC HYDROCARBONS

CLIENT: ERM-WEST - Dan Cutugno REPORT # 112075 PAGE 2

SAMPLE DESCRIPTION: OW-1 8.5 ft. ANLAB ID# 112075-1

STORET	COMPOUND	CONCENTRATION, mg/kg
34696	NAPTHALENE	210
34200	ACENAPHTHYLENE	48
34205	ACENAPTHENE	14
34381	FLUORENE	18
34461	PHENANTHRENE	150
34220	ANTHRACENE	40
34376	FLUORANTHENE	58
34469	PYRENE	100
34526	BENZO(A) ANTHRACENE	13
34320	CHRYSENE	15
34230	BENZO(B) FLUORANTHENE	<10
34242	BENZO(K) FLUORANTHENE	<10
34247	BENZO(A) PYRENE	<10
34556	DIBENZO(A,H) ANTHRACENE	<10
34521	BENZO(GHI) PERYLENE	<10
34403	INDENO(1,2,3-CD)PYRENE	<10

NOTE: ALL RESULTS CONFIRMED BY GC/MS.

DATA CERT. BY [signature] REPORT APPROV. BY [signature]

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MARCH 6, 1987
REPORT #111836 & 111894
DATE SAMPLED: 1/16/87 (111836)
1/26/87 (111894)
DATE REC'D: 1/20/87 (111836)
1/27/87 (111894)

ERM-WEST
1777 BOTELHO DRIVE SUITE 260
WALNUT CREEK, CALIFORNIA 94596

ATTN: DAN CUTUGNO

ENCLOSED ARE YOUR RESULTS FOR PROJECT #204 ANALYZED FOR POLY AROMATIC HYDROCARBONS BY EPA 625. IF THERE ARE ANY QUESTIONS, PLEASE FEEL FREE TO CALL AT (916)-447-2946.

DATA CERT. BY

REPORT APPROV. BY Roger Elliott

Anlab
ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO CALIFORNIA 95814 • 916-447-2946

EPA 610
POLYAROMATIC HYDROCARBONS

CLIENT: ERM-WEST PROJECT #204 REPORT # 111894 PAGE

SAMPLE DESCRIPTION: BORING W 2''X6'' ANLAB ID# 111894-1

STORET	COMPOUND	CONCENTRATION, MG/KG
34696	NAPTHALENE	<1.0
34200	ACENAPHTHYLENE	6.2
34205	ACENAPTHENE	<1.0
34381	FLUORENE	<1.0
34461	PHENANTHRENE	<1.0
34220	ANTHRACENE	<1.0
34376	FLUORANTHENE	4.5
34469	PYRENE	24
34526	BENZO(A) ANTHRACENE	3.8
34320	CHRYSENE	3.8
34230	BENZO(B) FLUORANTHENE	<1.0
34242	BENZO(K) FLUORANTHENE	2.0
34247	BENZO(A) PYRENE	1.0
34556	DIBENZO(A,H) ANTHRACENE	<1.0
34521	BENZO(GHI) PERYLENE	<1.0
34403	INDENO(1,2,3-CD)PYRENE	<1.0

DATA CERT. BY [signature] REPORT APPROV. BY Roger Elliott

TABLE 1-2
PHYSICAL AND CHEMICAL PROPERTIES OF THE COMPOUNDS OF CONCERN

	Vinyl Chloride	Benzo(a) Pyrene	Bis (2-ethylhexyl) Phthalate	Napthalene	Dieldrin	Trans-1,2-dichloroethene
Molecular Weight, g	62.5	252	391.0	128.2	381	96-94
Melting Point, °C	-155	179	-50	80	175-76	-50
Boiling Point, °C	-13.9	311	386.9	218	NA	47.5
Density, g/ml	0.9121	NAc	0.99	NA	NA	1.265
Parition Coefficients						
Water Solubility, ppm(25°C)	1.10E+03	3.80E-03	4.00E-01	3.17E+01	1.95E-01	600 (20°C)
Octanol-Water, Kow	17	1.15E+06	4.10E+09	1.95E+03	3.50E+03	123
Sediment-Water, Koc	8.2	5.50E+06	2.00E+09	940	1.70E+03	59
Microorganism-Water, Kb [(ug/g)/(mg/L)]	5.7	1.40E+05	2.30E+08	420	710	48
Volatilization Coefficients						
Henry' Law Constants, atm cu.m /mole	8.14E-02	4.90E-07	3.00E-07	4.60E-04	4.57E-10	6.70E-02
Vapor Pressure, torr (25°C)	2.66E+03	5.60E-09	2.0E-07 (20°C)	8.70E-02	1.78E-07	326 (20°C)
Reaeration Rate Ratio, Kvc/Kvo	0.675	NAVb	NAVb	NAV	NAV	0.601

a 1.78E+3 = 1.78 x 1000
b Since Henry's Law Constnat is so low, the reaeratiuon rate ratio is not applicable to volatilization calculations.
c NA = Not Applicable

References: U. S. EPA 1985a; Mabey, W. R., et al, 1982; Callahan, et al, 1979; Verschueren, K., 1983; Weast, 1974-75.

TABLE 1-3
RELATIVE IMPORTANCE OF AQUATIC PROCESSES INFLUENCING FATE OF COMPOUNDS OF CONCERN

Compound	Sorption	Volatilization	Biodegration	Photolysis-Direct	Hydrolysis	Bioaccummulation	Oxidation
Vinyl Chloride	-	+	-	-	-	-	+
Bis(2-ethylhexyl)-phthalate	+	-	+	-	-	+	-
Benzo(a) pyrene	+	+	+	+	-	+	-
Napthalene	+	-	+	+	-	-	-
Dieldrin	+	+	-	+	-	+	-
Trans-1,2-dichloroethene	-	+	?	-	-	-	+

Key to Symbols:
+ could be important fate process
- not likely to be an important fate process

Reference: Mills, W. B. et al, 1982

APPENDIX D

SOIL AND STOCKPILE WORK
AND RELATED LAB RESULTS

Anlab Analytical Laboratory
1914 S Street
Sacramento, CA 95814
(916) 447-2946

City and County of San Francisco
Industrial Waste Division

Refer to this number when billing and reporting -- 8844

Analysis requested -- 1) Analyze samples 1 thru 16 EPA #8015 mod (TPH)
2) Save remaining samples 1 thru 16
3) Review TPH results
4) If any samples show TPH <100 mg/kg, run EPA #610 on only those samples
5) Do not run EPA #610 on samples showing TPH >100

Sample Source	Sampling Period	Sample
GPS Stockpile	Wednesday 6/22/88	1 thru 16 (Dup-13A, 13B)

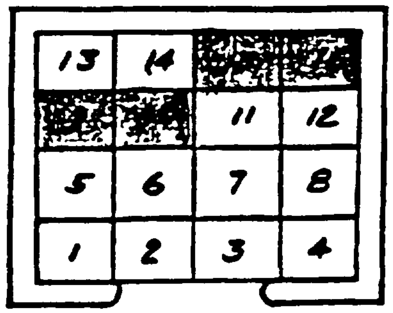
Samples Collected by: S. Mullinnix
Samples Received and stored by: S. Mullinnix
Samples Shipped by: Chris Spencer
Sample Shipment Checked by: Steve Mullinnix S Mullinnix

cc: 110
Anlab

To: H J Olsen　　　　　　　　　　　　　　　　　　Wed June 15. 1988
Th: P. Toal CWP
Fr: S. Mullinnix

Sub: Soil stockpile work

1) Remove top 18 inches from areas 9, 10, 15. and 16. and place material with other fill material. See area drawing.



2) Continue with work to sort large chunks of concrete and asphalt debris from the stockpiled soil

3) Begin removing sorted scrap metal from pile and create a seperate pile of scrap outside the berm area.

4) Copies of analytical results are attached for file purposes.

cc: 533P
ChrMem

Anlab
ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

June 10, 1988
Date Sampled: 05/10/88
Date Sample Received: 05/12/88
Report # 116440

City and County of San Francisco
Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

Attn: Steve Mullinnix

Project: Job #8834

SAMPLE DESCRIPTION	ANLAB ID#	Total Petroleum Hydrocarbons By 8015 Modified, mg/kg
Griffith SP #1	116440-1	360
Griffith SP #2	116440-2	960
Griffith SP #3	116440-3	900
Griffith SP #4	116440-4	3900
Griffith SP #5	116440-5	82
Griffith SP #6	116440-6	500
Griffith SP #7	116440-7	65
Griffith SP #8	116440-8	280
Griffith SP #9	116440-9	[illegible]
Griffith SP #10	116440-10	[illegible]
Griffith SP #11	116440-11	15000
Griffith SP #12	116440-12	24000
Griffith SP #13	116440-13	450
Griffith SP #14	116440-14	230
Griffith SP #15	116440-15	[illegible]
Griffith SP #16	116440-16	[illegible]

Data Certified By [signature]

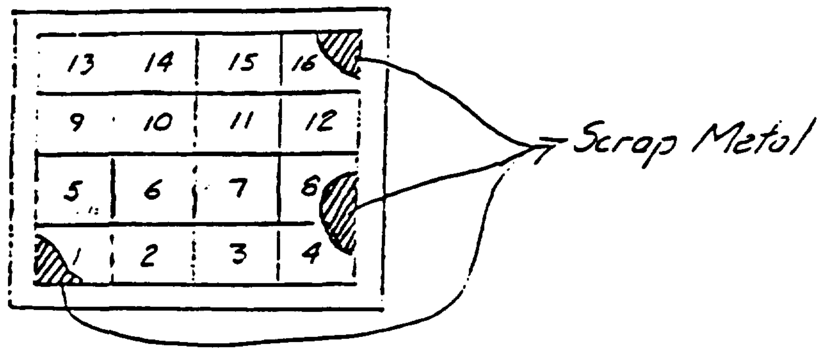
Report Approved By [signature]

To: H. J. Olsen
Th: P. Toal, CUP
Fr: S. Mullinnix

Mon June 20, 1988

Sub: Soil Stockpile Work

1) **Remove top 18 inches from areas 5 and 7, and place material with other fill material. See area drawing:**



2) Continue effort to sort large chunks of concrete and asphalt debris from stockpiled material.

3) **Remove all scrap metal from the pile.** Pile the scrap metal up in the area formerly occupied by explosive storage area.

4) Soil removal and metal removal can both be done by a front loader with the sorting bucket.

5) Copies of analytical results are attached for file purposes.

cc: 538A
ChrMem

53(

Anlab
ANALYTICAL LABORATORY
A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

June 10, 1988
Date Sampled: 05/10/88
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Industrial Waste Division
750 Phelps Street
San Francisco, CA 94124

Attn: Steve Mullinnix

Project: Job #8834

SAMPLE DESCRIPTION	ANLAB ID#	Total Petroleum Hydrocarbons By 8015 Modified, mg/kg
Griffith SP #1	116440-1	360
Griffith SP #2	116440-2	960
Griffith SP #3	116440-3	900
Griffith SP #4	116440-4	3900
Griffith SP #5	116440-5	82
Griffith SP #6	116440-6	500
Griffith SP #7	116440-7	65
Griffith SP #8	116440-8	280
Griffith SP #9	116440-9	20
Griffith SP #10	116440-10	<20
Griffith SP #11	116440-11	15000
Griffith SP #12	116440-12	24000
Griffith SP #13	116440-13	450
Griffith SP #14	116440-14	230
Griffith SP #15	116440-15	21
Griffith SP #16	116440-16	47

Data Certified By Karin Harris

Report Approved By Franklin J. Haywood

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A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO
Steve Mullinnix

Report # 116440 Page 2

Sample Description: Griffith SP #5

Anlab ID # 116440-5 Units: mg/kg

Date Sample Collected: 05/10/88
Project: Job #8834

Date Received @Lab: 05/12/88

Date Analysis Completed: 06/09/88

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	•0.005
34220	Anthracene	•0.081
34376	Fluoranthene	•2.0
34469	Pyrene	•2.5
34526	Benzo (a) anthracene	•0.190
34320	Chrysene	•0.410
34230	Benzo (b) fluoranthene	•0.500
34242	Benzo (k) fluoranthene	<0.004
34247	Benzo (a) pyrene	•0.71
34556	Dibenzo (a,h) anthracene	•2.7
34521	Benzo (g,h,i) perylene	•2.1
34403	Indeno (1,2,3-cd) pyrene	•1.2

12.4/7.4

Data Certified Init. [signature]

Report Approved Init. [signature]

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EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO
Steve Mullinnix

Report # 116440 Page 3

Sample Description: Griffith SP #7

Anlab ID # 116440-7 Units: mg/kg

Date Sample Collected: 05/10/88
Project: Job #8834

Date Received @Lab: 05/12/88

Date Analysis Completed: 06/09/88

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	0.23
34220	Anthracene	0.021
34376	Fluoranthene	1.2
34469	Pyrene	2.2
34526	Benzo (a) anthracene	0.47
34320	Chrysene	0.59
34230	Benzo (b) fluoranthene	0.59
34242	Benzo (k) fluoranthene	<0.004
34247	Benzo (a) pyrene	1.0
34556	Dibenzo (a,h) anthracene	3.1
34521	Benzo (g,h,i) perylene	2.1
34403	Indeno (1,2,3-cd) pyrene	1.4

12.9/8.7

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Report Approved Init. ________

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A DIVISION OF DEWANTE & STOWELL

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EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO
Steve Mullinnix

Report # 116440 Page 4

Sample Description: Griffith SP #9

Anlab ID # 116440-9 Units: mg/kg

Date Sample Collected: 05/10/88
Project: Job #8834

Date Received @Lab: 05/12/88

Date Analysis Completed: 06/09/88

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	0.18
34220	Anthracene	<0.2
34376	Fluoranthene	0.71
34469	Pyrene	0.71
34526	Benzo (a) anthracene	0.25
34320	Chrysene	0.29
34230	Benzo (b) fluoranthene	0.28
34242	Benzo (k) fluoranthene	<0.004
34247	Benzo (a) pyrene	0.32
34556	Dibenzo (a,h) anthracene	1.2
34521	Benzo (g,h,i) perylene	1.0
34403	Indeno (1,2,3-cd) pyrene	0.55

5.49 ✓

Data Certified Init. VW

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A DIVISION OF DEWANTE & STOWELL

1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO Report # 116440 Page 5
Steve Mullinnix

Sample Description: Griffith SP #10 Anlab ID # 116440-10 Units: mg/kg

Date Sample Collected: 05/10/88
Date Received @Lab: 05/12/88
Date Analysis Completed: 06/09/88
Project: Job #8834

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	0.15
34220	Anthracene	<0.2
34376	Fluoranthene	0.63
34469	Pyrene	<0.07
34526	Benzo (a) anthracene	0.18
34320	Chrysene	0.26
34230	Benzo (b) fluoranthene	<0.005
34242	Benzo (k) fluoranthene	<0.004
34247	Benzo (a) pyrene	0.25
34556	Dibenzo (a,h) anthracene	0.37
34521	Benzo (g,h,i) perylene	0.27
34403	Indeno (1,2,3-cd) pyrene	0.38

2.49 ✓

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO
Steve Mullinnix

Report # 116440 Page 6

Sample Description: Griffith SP #15

Anlab ID # 116440-15 Units: mg/kg

Date Sample Collected: 05/10/88
Project: Job #8834

Date Received @Lab: 05/12/88

Date Analysis Completed : 06/09/88

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	0.28
34220	Anthracene	<0.2
34376	Fluoranthene	1.1
34469	Pyrene	1.2
34526	Benzo (a) anthracene	0.38
34320	Chrysene	0.44
34230	Benzo (b) fluoranthene	0.45
34242	Benzo (k) fluoranthene	0.22
34247	Benzo (a) pyrene	0.44
34556	Dibenzo (a,h) anthracene	1.6
34521	Benzo (g,h,i) perylene	1.4
34403	Indeno (1,2,3-cd) pyrene	0.82

8.33

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1914 S STREET, SACRAMENTO, CALIFORNIA 95814 • 916-447-2946

EPA #8100
Polynuclear Aromatic Hydrocarbons

Client: CITY AND COUNTY OF SAN FRANCISCO
Steve Mullinnix

Report # 116440 Page 7

Sample Description: Griffith SP #16

Anlab ID # 116440-16 Units: mg/kg

Date Sample Collected: 05/10/88
Project: Job #8834

Date Received @Lab: 05/12/88

Date Analysis Completed: 06/09/88

Storet	Compound	Concentration
34696	Naphthalene	<0.5
34200	Acenaphthylene	<0.5
34205	Acenaphthene	<0.5
34381	Fluorene	<0.05
34461	Phenanthrene	0.31
34220	Anthracene	<0.2
34376	Fluoranthene	1.1
34469	Pyrene	1.2
34526	Benzo (a) anthracene	0.36
34320	Chrysene	0.52
34230	Benzo (b) fluoranthene	0.43
34242	Benzo (k) fluoranthene	<0.004
34247	Benzo (a) pyrene	0.47
34556	Dibenzo (a,h) anthracene	1.6
34521	Benzo (g,h,i) perylene	1.3
34403	Indeno (1,2,3-cd) pyrene	0.84

8.13✓

Data Certified Init. [signature]

Report Approved Init. [signature]

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS
73 No. Palm Street • Ventura, California 93001 (805) 652-0219 • FAX (805)652-0793

CANDLESTICK POINT STATE RECREATION AREA
SOIL AND WATER QUALITY INVESTIGATION REPORT

MARCH 13, 1990

This report was prepared by:

Andrew R. Holguin, R.E.A. #00124
President
Holguin, Fahan & Associates, Inc.

Mark R. Fahan, R.G. #4279, R.E.A. #01786
Vice President
Holguin, Fahan & Associates, Inc.

Ref. #5

HOLGUIN,
FAHAN
& ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS

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HOLGUIN, FAHAN & ASSOCIATES, INC.

ENVIRONMENTAL MANAGEMENT CONSULTANTS

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LIST OF FIGURES

LIST OF ATTACHMENTS

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS

1.0 INTRODUCTION

This report documents the procedures and results of the soil and water quality investigation performed by Holguin, Fahan & Associates, Inc., (HFA) to characterize a 34-acre site located along the Yosemite Canal, in San Francisco, California (see Figure 1). The work was commissioned by the Department of Parks and Recreation (DPR) in a Request for Proposal (RFP) entitled "Soil and Water Quality Investigation - Candlestick Point State Recreation Area (SRA)" dated April 1989. The work was conducted in accordance with HFA's work plan that was submitted to the DPR on August 24, 1989.

The purpose of the soil and ground water investigation was to provide preliminary data in order to identify and characterize potential environmental problems so that the suitability of the site as a proposed wetland nature area could be assessed. Creation of the desired wetland wildlife habitat will involve excavating and removing some of the existing fill, dredging the Yosemite Canal, and stabilizing the embankment along the southern side of the Yosemite Canal. Figure 2 shows the current and proposed shore lines of the Yosemite Canal as well as the area currently containing artificial fill.

2.0 BACKGROUND

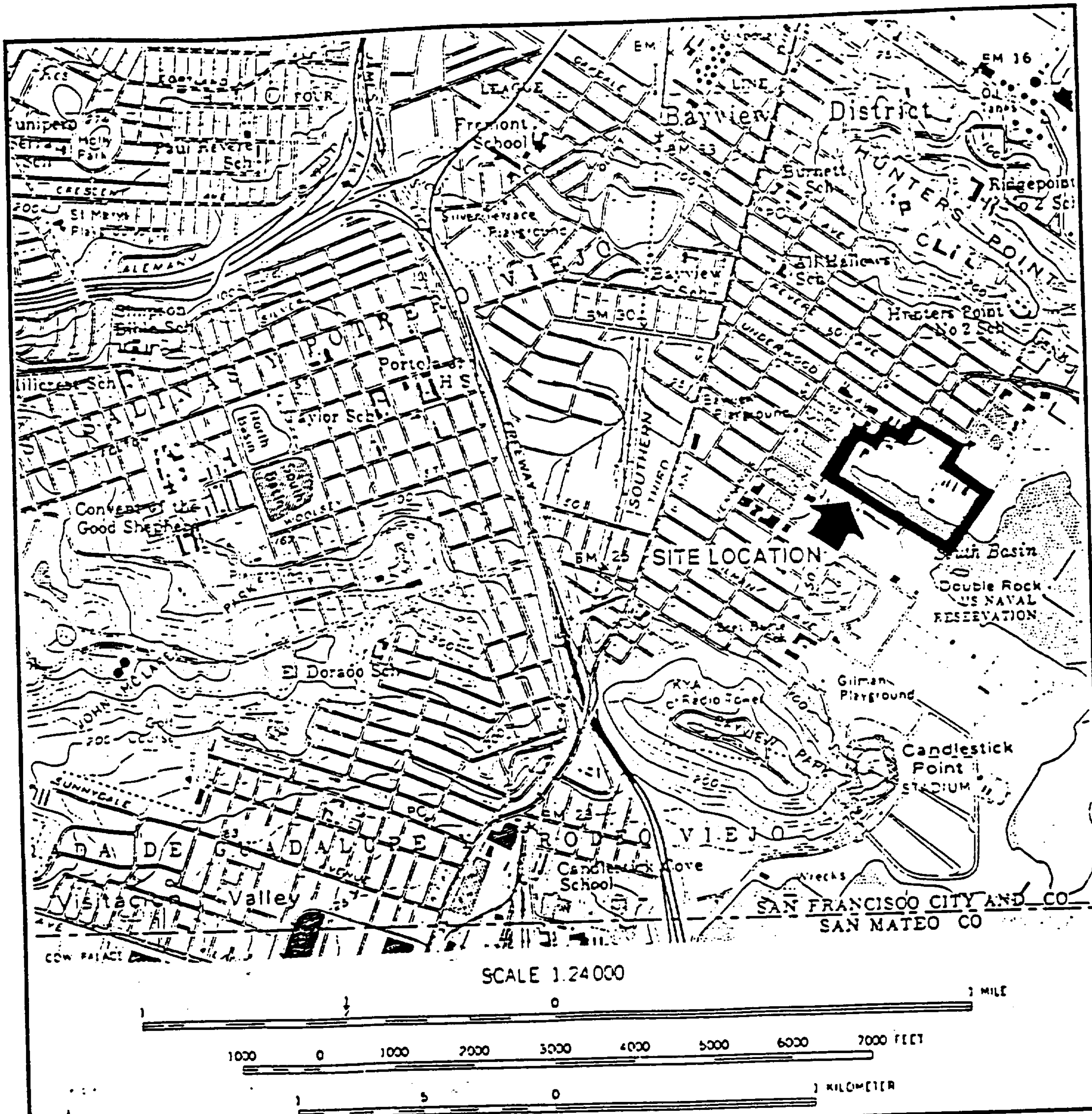
2.1 SITE DESCRIPTION AND HISTORY

The proposed 34-acre nature area is located on the eastern shore of the San Francisco Peninsula in the Candlestick Point SRA, San Francisco, California. The property is bounded by Thomas Avenue, the Griffith Street Pump Station and the Hunters Point Naval Shipyard to the north; Yosemite Avenue and Candlestick Park to the south; the San Francisco Bay to the east; and Hawes Street, a railroad right of way, and commercial/industrial businesses to the west. The site is relatively flat and has an elevation ranging between zero and 10 feet above mean sea level. The southern portion of the site is bisected by the Yosemite Canal, which opens into the San Francisco Bay. Water levels within the canal are influenced by tidal action and water depths vary between zero and approximately 10 feet in depth.

Tidal influ

Both the proposed nature area and its surroundings have been used for industrial purposes for at least 40 to 50 years and soil and ground water within the area is known to have been impacted by these usages. Potential sources of on-site contamination include: underground fuel storage tanks; petroleum and heavy metal contamination from automobile salvage operations; and contamination from off-site sources (see Table 1 and Figure 2). The known off-site sources of contamination include: underground tanks; the indiscriminate dumping of household and industrial waste; former and present automobile salvage yards; plating shops; furniture refinishing facilities; a tannery; a drum recycling facility; and several lumber yards (see Table 2 and Figure 2).

HOLGUIN, FAHAN & ASSOCIATES, INC.
ENVIRONMENTAL MANAGEMENT CONSULTANTS



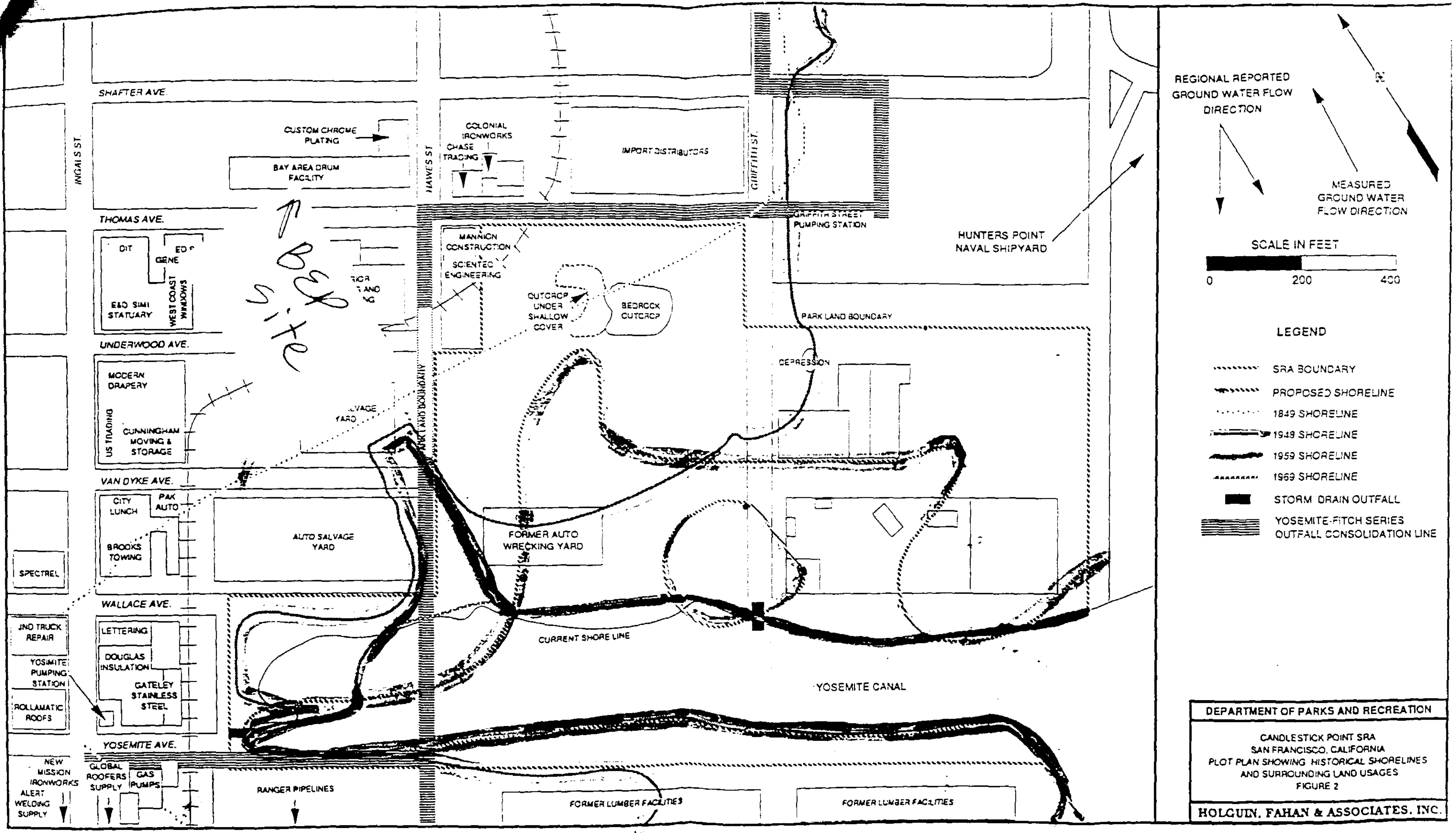
N

CONTOUR INTERVAL 25 FEET
NATIONAL GEODETIC VERTICAL DATUM 1929
DEPTH CURVES IN FEET—DATUM IS MEAN LOWER LOW WATER
THE RELATIONSHIP BETWEEN THE TWO DATUM IS VARIABLE
SHORELINE SHOWN REPRESENTS THE APPROXIMATE LINE OF MEAN HIGH WATER
THE MEAN RANGE OF TIDE IS APPROXIMATELY 4 FEET IN PACIFIC OCEAN
AND 5 FEET IN SAN FRANCISCO BAY

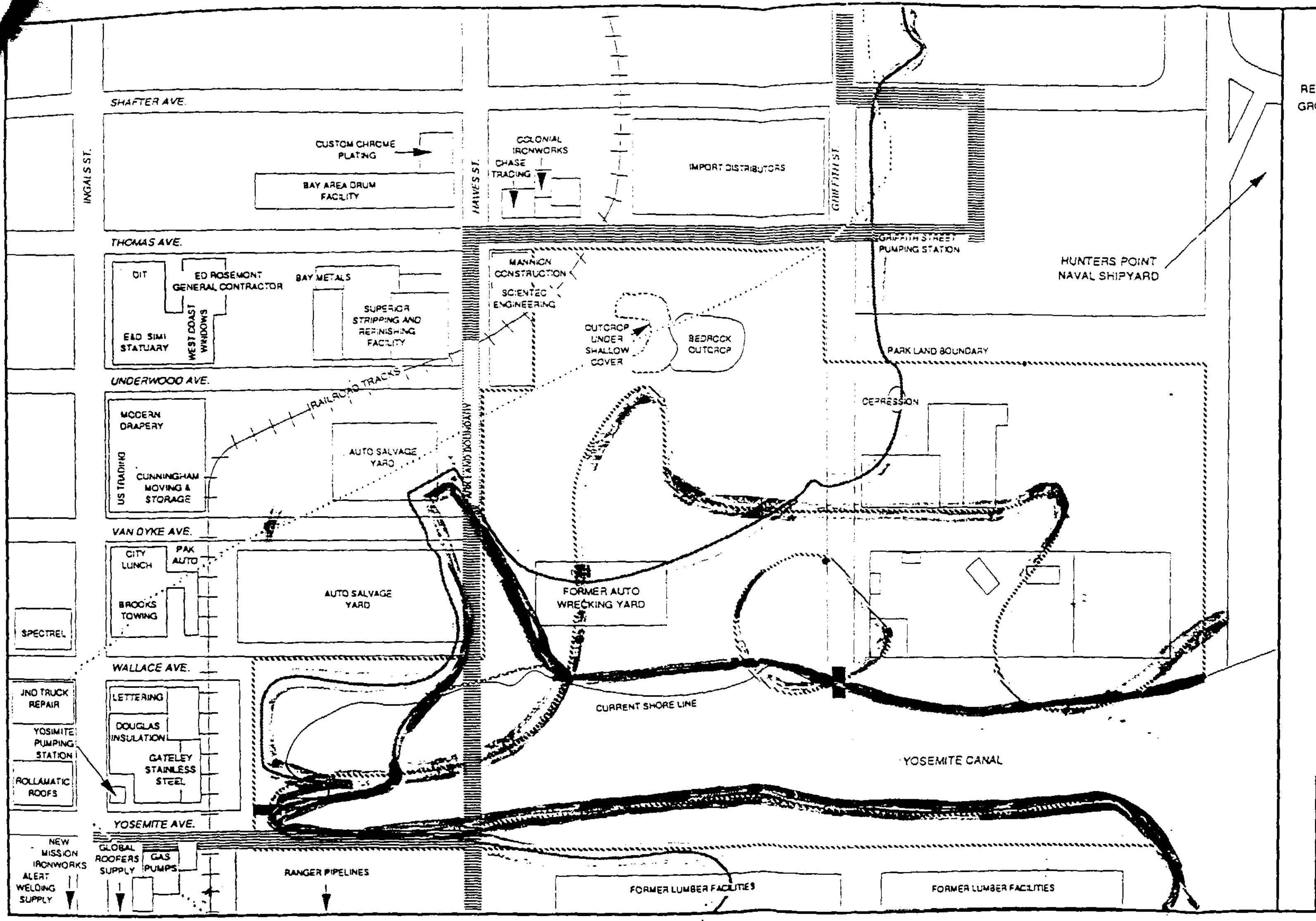
DEPARTMENT OF PARKS AND RECREATION

CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
SITE LOCATION MAP
FIGURE 1

HOLGUIN, FAHAN & ASSOCIATES, INC.


SHAFTER AVE.
THOMAS AVE.
UNDERWOOD AVE.
VAN DYKE AVE.
WALLACE AVE.
YOSEMITE AVE.
INGALLS ST.
JAMES ST.
GRIFFITH ST.
CUSTOM CHROME PLATING
BAY AREA DRUM FACILITY
COLONIAL IRONWORKS
CHASE TRADING
IMPORT DISTRIBUTORS
GRIFFITH STREET PUMPING STATION
MANNION CONSTRUCTION
SCIENTEC ENGINEERING
OUTCROP UNDER SHALLOW COVER
BEDROCK OUTCROP
HUNTERS POINT NAVAL SHIPYARD
PARK LAND BOUNDARY
DEPRESSION
GENE
E&O SIMI STATUARY
WEST COAST WINDOWS
MODERN DRAPERY
US TRADING
CUNNINGHAM MOVING & STORAGE
CITY LUNCH
PAK AUTO
BROOKS TOWING
AUTO SALVAGE YARD
FORMER AUTO WRECKING YARD
SPECTREL
LETTERING
DOUGLAS INSULATION
GATELEY STAINLESS STEEL
YOSEMITE PUMPING STATION
ROLLAMATIC ROOFS
CURRENT SHORE LINE
YOSEMITE CANAL
NEW MISSION IRONWORKS
ALERT WELDING SUPPLY
GLOBAL ROOFERS SUPPLY
GAS PUMPS
RANGER PIPELINES
FORMER LUMBER FACILITIES
FORMER LUMBER FACILITIES
REGIONAL REPORTED GROUND WATER FLOW DIRECTION
MEASURED GROUND WATER FLOW DIRECTION
SCALE IN FEET
0
200
400
LEGEND
SRA BOUNDARY
PROPOSED SHORELINE
1849 SHORELINE
1948 SHORELINE
1959 SHORELINE
1969 SHORELINE
STORM DRAIN OUTFALL
YOSEMITE-FITCH SERIES OUTFALL CONSOLIDATION LINE
DEPARTMENT OF PARKS AND RECREATION
CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
PLOT PLAN SHOWING HISTORICAL SHORELINES AND SURROUNDING LAND USAGES
FIGURE 2
HOLGUIN, FAHAN & ASSOCIATES, INC.

Department of Parks and Recreation
Candlestick Point State Recreation Area
March 13, 1990 - Page 3



DEPARTMENT OF PARKS AND RECREATION

CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
PLOT PLAN SHOWING HISTORICAL SHORELINES AND SURROUNDING LAND USAGES
FIGURE 2

HOLGUIN, FAHAN & ASSOCIATES, INC.

TABLE 1.
SUSPECTED ON-SITE SOURCES AND RESULTANT CONTAMINANTS

FUEL STORAGE TANKS	AUTOMOTIVE DISMANTLING AND REPAIR	UNKNOWN SOURCES
Petroleum Hydrocarbons, Lead	Petroleum Hydrocarbons, Lead, Other Organic and Inorganic Contaminants	Silicon Tetrachloride, PCB's, Solvents, Lead and Other Metals, Acids

TABLE 2.
IDENTIFIED OFF-SITE SOURCES AND RESULTANT CONTAMINANTS

UPGRADIENT TANNERY*	WOOD TREATMENT	BAY AREA DRUM	OTHER
Calcium Sulfide, Chromium Salts, Aluminum Salts, Acid, Sulfonated Phenols, Phenols, Formaldehyde	Copper, Chromium, Arsenic, Mercury, Formalin, Creosote, Chlorinated Phenols	Lead, Pesticides, PCB's, Oil & Grease, Vinyl Chloride, TCE, Methylene Chloride	Solvents, Acids, Metals, Others

*Not shown in Figure 2.

Levine-Fricke conducted a historical aerial photographic and records review of the site and surrounding area in 1988 (see Attachment 1 for a list of references). This study showed that the proposed nature area and surrounding land are located on reclaimed marshland and that much of the area once lay below the San Francisco Bay. The area has been progressively filled to accommodate expanding light industry in the area, and the shoreline has encroached eastward over the past century (see Figure 2). Levine-Fricke's assessment included an aerial photographic review of the years 1935, 1948, 1959, 1969, 1977 and 1985.

2.2 SURROUNDING AREA USAGE

The site is located in an area of reclaimed marshland along the western shores of the San Francisco Bay in an area that was used for dairy farming up until 1935. Since that time, light industry has been steadily increasing in density. Filling of the marshland began in the late 1930's or early 1940's.

A number of light industrial businesses have been operated in the past, and are currently operating in the immediate area (see Figure 2 for business locations). These include: metal fabricators; chrome platers; automobile salvage and wrecking yards; a drum recycling facility; lumber facilities; stripping and refinishing facilities; and other miscellaneous small manufacturing and industrial businesses. Additionally, a large sewer system, the Yosemite-Fitch sewer consolidation project, was recently completed through and adjacent to the northern part of the site. This project involves a 96-inch diameter sewer pipe and 17 to 40 foot wide box culverts that run under Yosemite Avenue from Ingles Street to Hawes Street, cross the

Yosemite Canal and run parallel to Hawes Street. The culverts were placed in trenches that were 17 to 30 feet deep.

Bay Area Drum, Inc., operated a drum recycling facility from the 1940's to 1987 on the corner of Thomas Avenue and Hawes Street. The facility handled numerous types of hazardous materials and in 1987 was closed and placed on the California Superfund list. Concentrations of lead, pesticides and PCB's above the California Department of Health Services' (DHS) total threshold limit concentrations (TTLC) were found in soil samples collected on site and from the surrounding lots during investigations by CH2M Hill in July 1987 (Levine-Fricke, 1988). In addition, oil, grease and numerous other organic compounds were found in soil samples from the vicinity of the site. Ground water samples from downgradient monitoring wells exceeded DHS drinking water action levels for chlorine, PCB's, vinyl chloride, methylene chloride and TCE (CH2M Hill, 1987).

Hunters Point Naval Station, located 2,000 feet east-northeast, is also undergoing investigations for possible soil, ground water and surface water contamination.

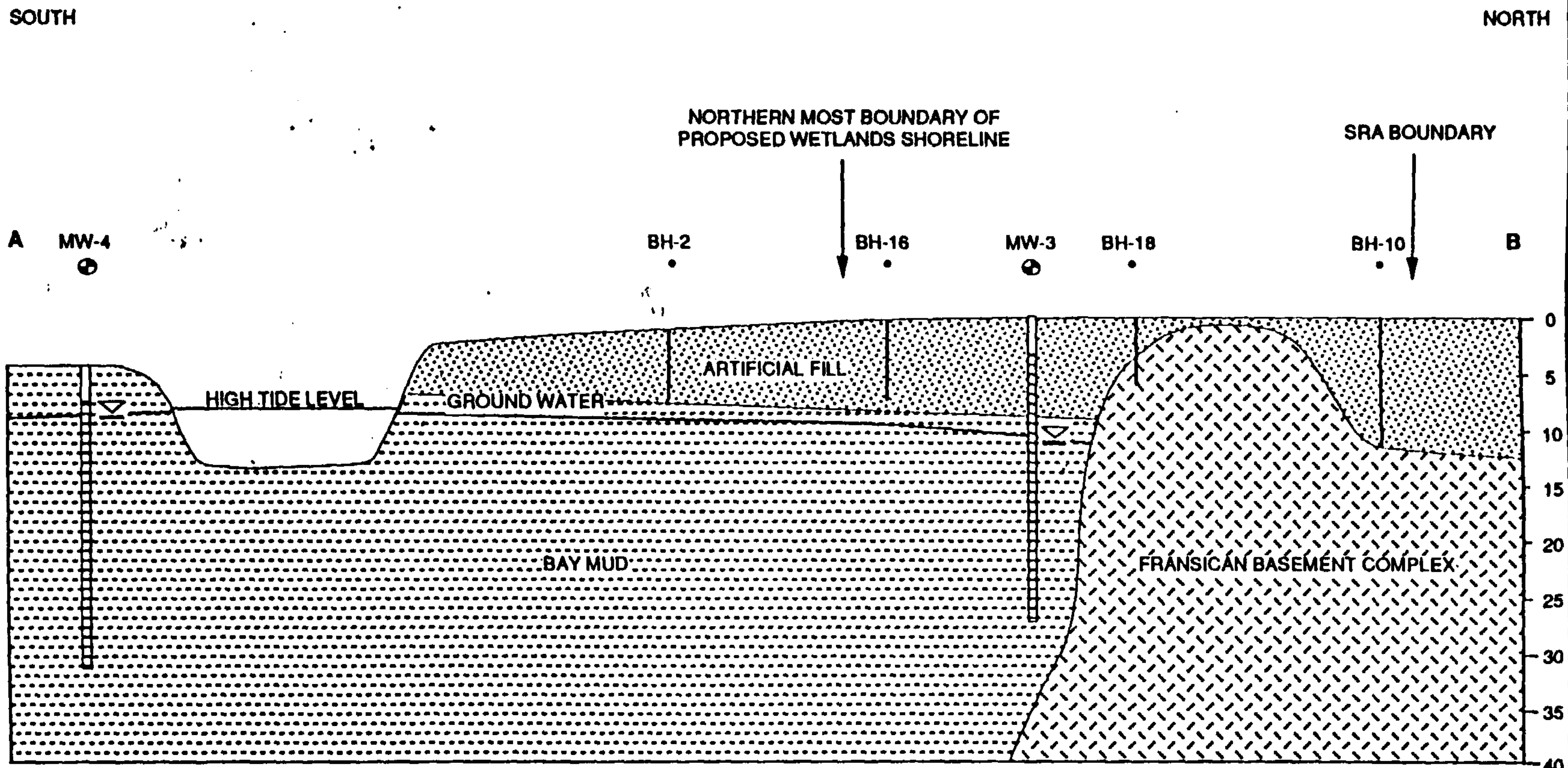
Other potential contaminant sources in the area include: indiscriminate dumping of household refuse; automobile parts; paint and paint thinner; building materials, such as brick, concrete and wood along the railroad tracks at the termination of Van Dyke, Wallace and Yosemite Avenues; and several drums containing one to two gallons of silicon tetrachloride that were removed in early 1987 by the City of San Francisco from the lot west of Griffith Street between Underwood and Thomas Avenues. Park Rangers also reported the presence of underground storage tanks in the lots west of Griffith Street between Underwood and Shafter Avenues.

2.3 GENERAL GEOLOGY AND HYDROGEOLOGY

2.3.1 General Geology

The near surface materials over the majority of the site are composed of fill containing a mixture of silty and clayey sand with various amounts of gravel, wood, brick, rock and concrete debris. The fill is underlain by Bay Mud, Bayside Sand and bedrock of the Franciscan Formation. The Bay Mud is composed of gray to greenish-gray clay and silty clay, is soft to medium-stiff in consistency, and has localized layers of sand, peat and organic clay. This unit was encountered in most monitoring wells installed during this survey at depths below 10 feet (see Attachment 2 for soil boring and monitoring well logs, and Figure 3 for the geologic cross-section).

Underlying the Bay Mud is a sand unit referred to as Bayside Sand (Dames and Moore, 1988). This is a dense, clean to clayey sand that reaches a maximum thickness of 70 feet in the vicinity of the site. This unit was not encountered during this study.



10 X 1 VERTICAL EXAGGERATION

LEGEND

HORIZONTAL SCALE
IN FEET

0 50 100

SEE FIGURE 8 FOR LINE OF CROSS SECTION

GROUND WATER MONITORING WELLS

BOREHOLES

DEPTH OF GROUND WATER

DEPARTMENT OF PARKS AND RECREATION

CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
CROSS-SECTION A-B
FIGURE 3

HOLGUIN, FAHAN & ASSOCIATES, INC.

The area is underlain by bedrock of the Franciscan assemblage. The Franciscan is composed of altered volcanics, sandstone, siltstone and shale within a structurally disorganized melange formation. Franciscan bedrock crops out in the northern portion of the site in a topographical high located south of Thomas Avenue between Griffith and Hawes Streets (see Figure 2). This bedrock outcrop is composed of metamorphosed volcanic rock (greenstone), which was the only bedrock lithology encountered during this investigation. Greenstone "knockers" such as this generally occur as isolated blocks within sandstones and shales of the Franciscan Formation and the areal distribution of this type of rock below the fill material is not known. Angular greenstone rock fragments measuring a few inches to a foot in diameter make up a large component of the fill material that is scattered over the northern part of the site. These rock fragments appear to have originated from the bedrock outcrop, possibly during grading activities at the site.

2.3.2 Hydrogeology

Ground water in the area has been reported at depths between five and 16 feet below ground level in nearby monitoring wells (Dames and Moore, 1988 and Levine-Fricke, 1988). Ground water within monitoring wells installed during this study was encountered at depths of between four and 15 feet below ground level (see Table 3).

In order to determine ground water elevations and the direction of ground water flow at the site, all monitoring well elevations were surveyed to an accuracy of ±0.01 foot and a datum was established at the high tide water mark measured on the Griffith Street storm drain outfall located on the northern side of the Yosemite Canal. Water levels within each monitoring well were then measured to an accuracy of ±0.01 foot using electronic measuring. Ground water depths were then subtracted from the established datum and ground water elevations for the area were calculated (see Table 3).

**TABLE 3.
ELEVATION AND DEPTH OF GROUND WATER**

WELL NUMBER	FLOATING PRODUCT	WELL ELEVATION (feet above high tide level)	DEPTH TO GROUND WATER	ELEVATION OF GROUND WATER
MW-1	NONE	7.25	9.14	-1.89
MW-2	NONE	7.52	15.03	-7.51
MW-3	NONE	7.93	10.32	-2.39
MW-4	NONE	4.04	4.66	-0.62
MW-5	NONE	7.51	6.97	-0.54
MW-6	NONE	7.51	6.46	-1.05

Elevations relative to the high tide mark on the Griffith Street storm drain. The mark was 6.0 feet below the top of the storm drain at street level. Water levels were measured on November 25, 1989, between 10:50 and 11:30 a.m. High tide at Hunters Point Naval Shipyard for this date was +6.8 feet at 9:24 a.m. and low tide was 0.0 feet at 16:24.

The direction of ground water flow was determined to be to the north in the area located north of the Yosemite canal as calculated from the data shown in Table 3. This ground water flow direction is opposite of the regional ground water flow direction reported by Levine-Fricke in its March 3, 1988, report. The local ground water flow direction is believed to be greatly influenced by tidal fluctuations and may vary as much as 180 degrees, depending on tidal levels.

A potentiometric contour map of the top of the water table is shown in Figure 4. As can be seen from the map, the calculated ground water flow direction and gradient is largely influenced by the exceptionally low ground water elevation measured from monitoring well MW-2. Ground water within this well was five feet lower than within any other well on site. This may be due to a depressed water table associated with the newly constructed sewer outfall facilities located directly east of the well along Hawes Street. The ground water flow direction and gradient shown in Figure 4 may not therefore be indicative of flow directions and gradients in portions of the site not within the zone of influence of the sewer outfall facilities.

Drainage of surface runoff in paved areas surrounding the site is generally channeled into municipal storm drains. Surfacial drainage in non-paved areas located on site is expected to flow to the south into the Yosemite Canal and/or the San Francisco Bay.

Ground water within the City of San Francisco is not currently used for any beneficial purposes due to its poor quality and high concentration of total dissolved solids.

3.0 SITE ASSESSMENT PROCEDURES

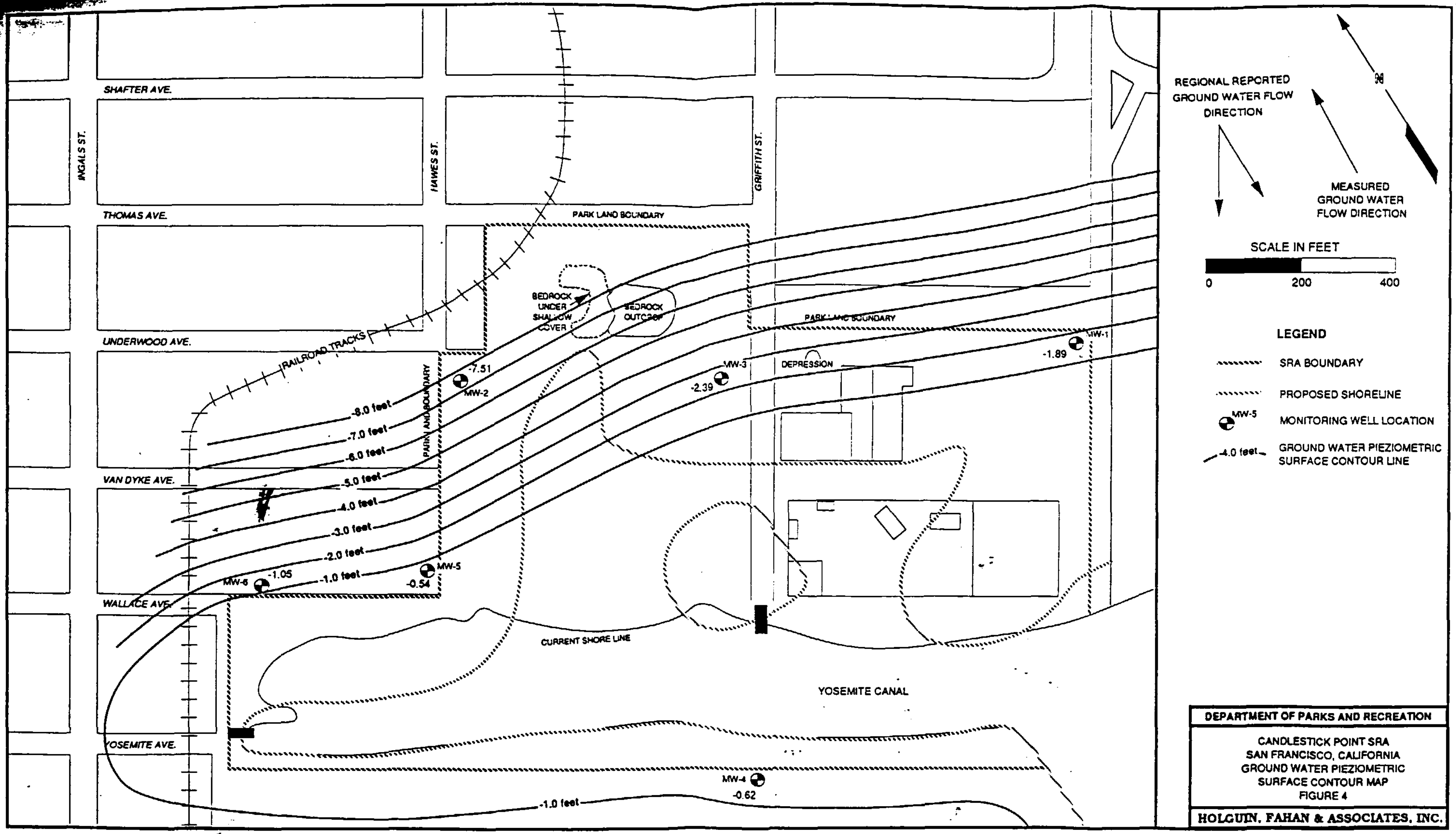
Site assessment procedures consisted of an area wide soil vapor survey, the drilling and sampling of 20 shallow boreholes, the installation and sampling of six ground water monitoring wells, sediment sampling from the Yosemite Canal, and limited surface water sampling.

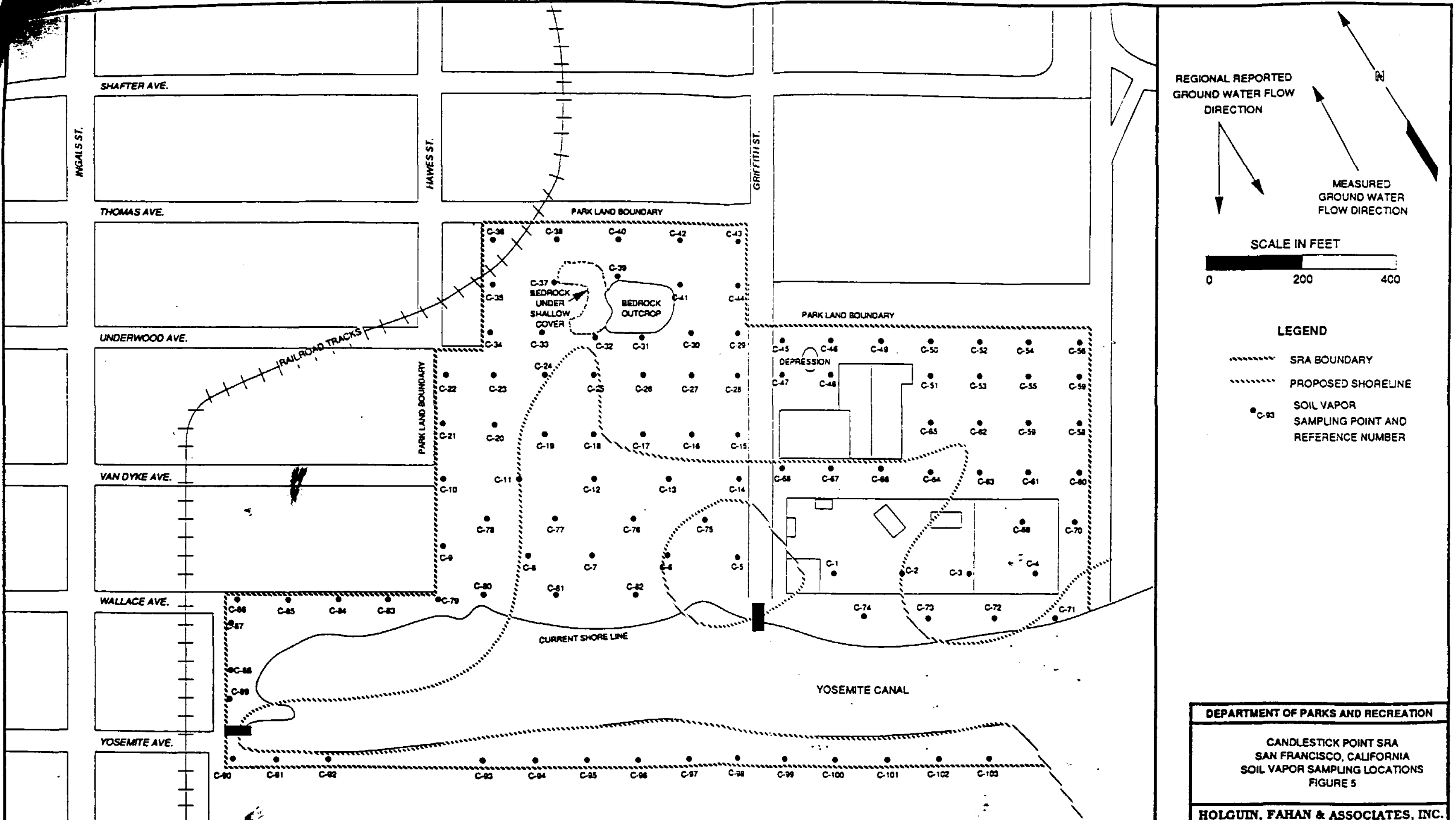
3.1 SOIL ASSESSMENT

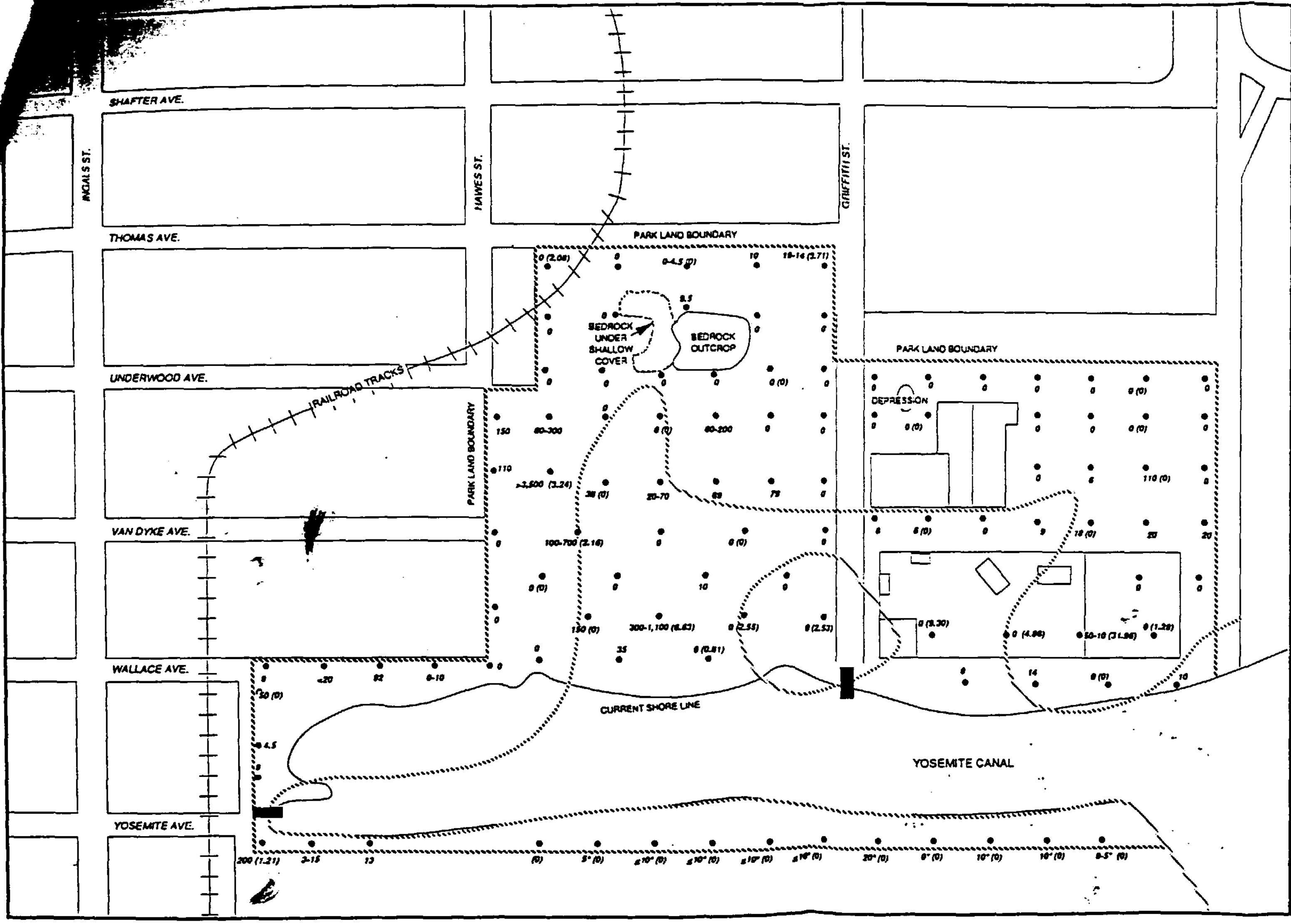
Soils on the site were characterized by soil vapor surveying, soil sampling and analyses. These are described in more detail below.

3.1.1 Soil Vapor Survey

The soil vapor survey consisted of 103 individual sampling points located in a regular grid pattern throughout the nature area (see Figure 5). At each point, the soil vapors were tested with a Photovac™ or Hnu™ photoionization detector (PID); a Summit Interests™ flame ionization detector (FID); or a Photovac™ 10S50 gas chromatograph (GC) equipped with a wide-bore capillary column and an internal oven for temperature control (see Figure 6). These instruments


SHAFTER AVE.
THOMAS AVE.
UNDERWOOD AVE.
VAN DYKE AVE.
WALLACE AVE.
YOSEMITE AVE.
INGALS ST.
HAWES ST.
GRIFFITH ST.
RAILROAD TRACKS
PARK LAND BOUNDARY
PARK LAND BOUNDARY
PARK LAND BOUNDARY
BEDROCK UNDER SHALLOW COVER
BEDROCK OUTCROP
DEPRESSION
CURRENT SHORE LINE
YOSEMITE CANAL
-8.0 feet
-7.0 feet
-6.0 feet
-5.0 feet
-4.0 feet
-3.0 feet
-2.0 feet
-1.0 feet
-1.0 feet
MW-1
-1.89
MW-2
-7.51
MW-3
-2.39
MW-4
-0.62
MW-5
-0.54
MW-6
-1.05
REGIONAL REPORTED GROUND WATER FLOW DIRECTION
MEASURED GROUND WATER FLOW DIRECTION
N
SCALE IN FEET
0
200
400
LEGEND
SRA BOUNDARY
PROPOSED SHORELINE
MW-5
MONITORING WELL LOCATION
-4.0 feet
GROUND WATER PIEZOMETRIC SURFACE CONTOUR LINE
DEPARTMENT OF PARKS AND RECREATION
CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
GROUND WATER PIEZOMETRIC
SURFACE CONTOUR MAP
FIGURE 4
HOLGUIN, FAHAN & ASSOCIATES, INC.


SHAFTER AVE.
THOMAS AVE.
UNDERWOOD AVE.
VAN DYKE AVE.
WALLACE AVE.
YOSEMITE AVE.
INGALS ST.
HAWES ST.
GRIFFITH ST.
RAILROAD TRACKS
PARK LAND BOUNDARY
BEDROCK UNDER SHALLOW COVER
BEDROCK OUTCROP
DEPRESSION
CURRENT SHORE LINE
YOSEMITE CANAL
REGIONAL REPORTED GROUND WATER FLOW DIRECTION
MEASURED GROUND WATER FLOW DIRECTION
N
SCALE IN FEET
0
200
400
LEGEND
SRA BOUNDARY
PROPOSED SHORELINE
SOIL VAPOR SAMPLING POINT AND REFERENCE NUMBER
DEPARTMENT OF PARKS AND RECREATION
CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
SOIL VAPOR SAMPLING LOCATIONS
FIGURE 5
HOLGUIN, FAHAN & ASSOCIATES, INC.



DEPARTMENT OF PARKS AND RECREATION

CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
SOIL VAPOR CONCENTRATIONS
(PPM HEXANE)
FIGURE 6

HOLGUIN, FAHAN & ASSOCIATES, INC.

are capable of detecting volatile organic vapors in subsurface soils at the part per million (ppm) level.

The soil vapors were sampled by driving a 5/8-inch diameter stainless steel probe into the subsurface to depths of three to six feet. The probe was withdrawn leaving a cavity in the subsurface. A short (12 inch long) hollow, soil vapor, sampling probe was then inserted within the cavity and the vapors were extracted through the probe by means of a vacuum pump. Extracted vapors were then passed through either an FID or PID where the detector measured the concentration of the organic vapors in the sample. The FID was the primary analytical instrument used for the survey, however, the Photovac™ TIP 1 PID was also used to analyze vapor samples C-94 to C-103 because the FID malfunctioned during the final stages of the project. Additionally, 38 percent of the samples were analyzed using the GC in order to check and verify the FID and PID analyses (see Figure 7 for a diagram of the soil vapor sampling technique). Field blanks and calibration standards were run at the beginning of each day and all instruments were recalibrated periodically during the day.

3.1.2 Equipment Description

The following pieces of equipment were utilized during this survey and sample collection:

- Flame Ionization Detector: Summit Interests™ Model 1000;
- Photoionization Detector: Photovac™ TIP1 and Hnu™ Model PI101;
- Gas Chromatograph: Photovac™ Model 10S50; and
- Soil Probes: Hollow stainless steel, 5/8-inch diameter;
- Tubing: All Teflon™ tubing and seals; and
- Column: Wide-bore capillary column, heated and temperature regulated.

The FID is produced by Summit Interests of Colorado Springs, Colorado. Rechargeable batteries for up to eight hours of operation are built-in, as well as a lecture bottle of high purity hydrogen gas supplying enough carrier gas for up to 10 hours of operation. The FID is calibrated by measuring standard gas(es) and programming the library within the instrument. The injection of calibration gas(es) will be made at the beginning of each sampling day and after every five to eight sample runs. The FID contains a built-in interrogator that will quantify the ppm of a vapor when compared to known concentrations of standards.

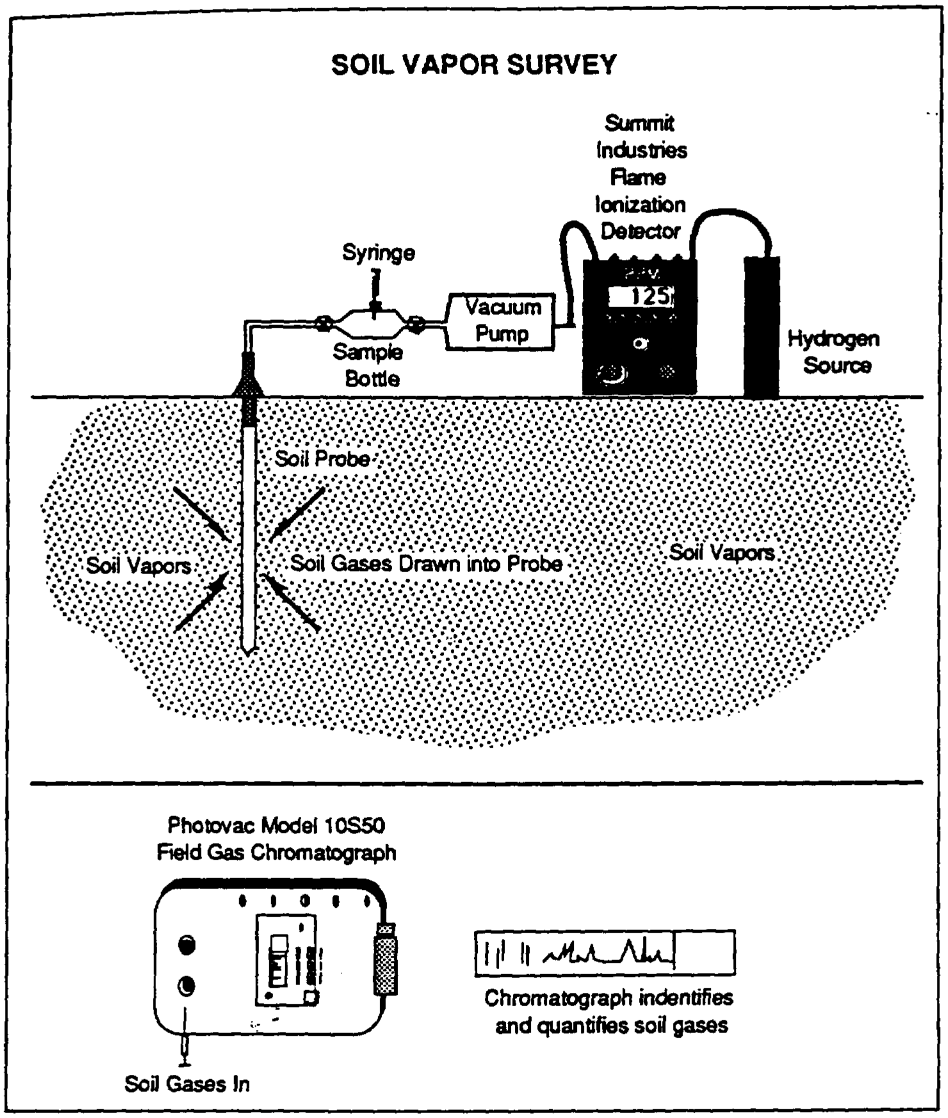


FIGURE 7.

The PID is produced by Photovac, Inc., of Thornhill, Ontario. The PID has built-in rechargeable batteries for up to four hours of operation with attachable battery packs supplying up to eight additional hours of operation. The PID is calibrated by measuring standard gas(es) of known concentrations. The instrument calibration was made at the beginning of each sampling day and after every five to eight sample runs.

The GC is produced by Photovac, Inc., of Thornhill, Ontario. It is packaged in a rugged, anodized aluminum case with a total weight of 11 kilograms. Rechargeable batteries for up to eight hours of operation are built-in, as well as a lecture bottle of high purity air supplying enough carrier gas for up to 10 hours of operation. The GC is equipped with a heated and temperature-regulated wide-bore capillary column and a photoionization detector (PID) and contains a built-in interrogator and four libraries holding up to 25 compounds per library and enabling a chromatograph to be interpreted qualitatively and quantitatively when compared to known concentrations of standards. This instrument has the capability of separating compounds and quantifying them in the field with a sensitivity down to levels as low as 0.1 part per billion (ppb) for a one-milliliter sample volume and with a 4:1 signal to noise ratio. New peaks will be identified using their relationship to the retention times of the reference peaks. The GC is calibrated by injecting 12 microliters of standard gas(es) and programming the library within the instrument. The 12-microliter injection of calibration gas(es) was made at the beginning of each sampling day and after every five to eight sample runs.

3.1.3 Quality Assurance/Quality Control Procedures

Quality Control/Quality Assurance procedures consisted of the following:

- Calibration: Beginning of each day and every five to eight analyses thereafter;
- Field Blanks: At least daily and thereafter as needed; and

Carrier gas and soil vapor sampler system blanks were run at the beginning of the day and after every five to eight soil vapor samples to identify any latent background contamination in the GC or soil vapor sampler. Field blanks were run to check for contamination within the sampling equipment at least once daily and as often as thought needed by the operator.

Each soil vapor analyses was documented within a field logbook, and on a soil vapor monitoring log. Strip chart chromatograms were produced for each sample analyzed by the GC. The GC strip charts are maintained within the project file at HFA's corporate office. The GC data generated from the soil vapor survey is included in Attachment 3.

Additionally, the stainless steel probe was decontaminated between sampling points to prevent cross-contamination. This procedure consisted of an Alconox detergent wash; tap water rinse; and two distilled, deionized water rinses. The vapor sampling flask was purged with ambient air between samples to flush out contaminants from the previous analysis.

3.1.4 Soil Vapor Survey Results

Because vapors at the site were of an unknown composition, specific compounds or contaminants were not identified during the survey. Vapor concentrations are therefore reported as ppm referenced to a 100 ppm hexane standard. Soil vapor sampling locations are shown on Figure 5 and soil vapor concentrations are shown on Figure 6 and are listed in Table 4). The GC data reduction calculations are included in Attachment 3.

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TABLE 4.
SOIL VAPOR CONCENTRATIONS
(ppm)

SOIL VAPOR SAMPLE NUMBER	INSTRUMENT AND CONCENTRATON		
	FID	PID	GC
C-1	0	-	9.30
C-2	0	-	4.86
C-3	10-50	-	31.96
C-4	0	-	1.28
C-5	0	-	2.53
C-6	0	-	2.55
C-7	300-1100	-	6.64
C-8	150	-	0
C-9	0	-	-
C-10	0	-	-
C-11	100-700	-	2.16
C-12	0	-	-
C-13	0	-	0
C-14	0	-	-
C-15	0	-	-
C-16	79	-	-
C-17	69	-	-
C-18	20-70	-	-
C-19	38	-	0
C-20	>3500	-	3.24
C-21	110	-	-
C-22	150	-	-
C-23	60-300	-	-
C-24	0	-	-
C-25	0	-	0
C-26	60-200	-	-
C-27	0	-	-
C-28	0	-	-
C-29	0	-	-
C-30	0	-	0
C-31	0	-	-
C-32	0	-	-
C-33	0	-	-
C-34	0	-	-
C-35	0	-	-
C-36	0	-	2.08
C-37	0	-	
C-38	0	-	-
C-39	9.5	-	-
C-40	0-4.5	-	0
C-41	0	-	-
C-42	10	-	-
C-43	14-19	-	3.71
C-44	0	-	-
C-45	0	-	-
C-46	0	-	-
C-47	0	-	-
C-48	0	-	0
C-49	0	-	-
C-50	0	-	-
C-51	0	-	-
C-52	0	-	-

SOIL VAPOR SAMPLE NUMBER	INSTRUMENT AND CONCENTRATON		
	FID	PID	GC
C-53	0	-	-
C-54	0	-	0
C-55	50	-	0
C-56	0	-	-
C-57	0	-	-
C-58	0	-	
C-59	110	-	0
C-60	20	-	-
C-61	20	-	-
C-62	6	-	-
C-63	18	-	0
C-64	9	-	-
C-65	0	-	-
C-66	0	-	-
C-67	6	-	0
C-68	6	-	-
C-69	0	-	-
C-70	0	-	-
C-71	10	-	-
C-72	0	-	0
C-73	14	-	-
C-74	0	-	-
C-75	0	-	-
C-76	10	-	-
C-77	0	-	-
C-78	0	-	0
C-79	-	-	-
C-80	0	-	-
C-81	35	-	-
C-82	0	-	0
C-83	0-10	-	-
C-84	92	-	-
C-85	<20	-	-
C-86	9	-	-
C-87	50	-	0
C-88	4.5	-	-
C-89	9	-	-
C-90	200	-	1.21
C-91	3-15	-	-
C-92	13	-	-
C-93	NR	-	0
C-94	-	5	0
C-95	-	≤10	0
C-96	-	<10	0
C-97	-	<10	0
C-98	-	≤10	0
C-99	-	20	0
C-100	-	0	0
C-101	-	10	0
C-102	-	10	0
C-103	-	0-5	0

- = Not used; NR = No reading. See Attachment 3 for GC data reduction and fieldlogs. Calibrated to 100 ppm hexane.

The results of the soil vapor survey show volatile organic vapors in the range of zero to 3,500 ppm as determined by FID analyses, and zero to 32 ppm as determined by PID and GC analyses. At locations where both the FID and the GC data were collected, the readings correlated well for locations with low vapor concentrations (those less than 10 ppm) and poorly for locations where high FID concentrations were detected. The high FID readings obtained at these locations are therefore interpreted as organic compounds that are not ionizable by photoionization techniques using ultraviolet light such as the PID and GC utilize. One common organic compound that can be detected using an FID and cannot be detected by a PID is methane, which is a degradation by-product commonly occurring at landfilled sites. Methane is not considered to be an environmental hazard at the concentrations observed during this study (up to 3,500 ppm).

Because the high FID readings are interpreted as methane, they can be discounted as potential contaminant locations where GC analyses showed low or non-detectable volatile organic concentrations (low concentrations are generally considered to be 10 ppm or below on the GC). Location C-3 was the only location that showed elevated volatile vapor concentrations on the GC (see Table 4). A soil sample was subsequently collected and analyzed from this location (see results from sample location BH-11 - Table 5). The results from this soil sample indicate that no volatile contamination as measured by Environmental Protection Agency (EPA) Method 8240 at concentrations above the detection levels for laboratory analytical method were present at location BH-11 (same as soil vapor location C-3).

3.1.3 Soil Borings and Canal Sediments

3.1.3.1 Sampling Procedures

Twenty-six soil borings, including six monitoring wells, were drilled to evaluate potential on-site soil contamination at the locations shown in Figure 8. Boreholes were sited at locations that showed high soil vapor concentrations as detected during the soil vapor survey, and were concentrated in the proposed excavation area for the wetlands. Boreholes were drilled using either a three-inch inside diameter hand auger or an eight-inch outside-diameter (OD) truck-mounted hollow-stem flight auger. During the drilling process, soil cuttings were logged by a California State registered geologist or an environmental professional under the supervision of a registered geologist in accordance with the Unified Soil Classification System (USCS). Soil cuttings from all boreholes were monitored for contamination with the use of olfactory senses, visual identification and a PID and this information was included on the logs (see Attachment 2).

Boreholes were drilled to the top of the water table or until penetration was blocked because of subsurface rubble or bedrock (generally at depths from three to 10 feet). Undisturbed soil samples were collected by means of a drive sampler lined with brass or stainless steel sampling rings. Sampling depths were targeted for one and four feet, and just above the water table; however, the depths from which samples were actually collected varied and were dependant upon individual borehole conditions (see Attachment 2 for specific sampling depths). Sampling and drilling equipment was decontaminated between boreholes by means of a non-phosphate soap wash, tap water rinse and two deionized water rinses, in accordance with EPA protocol. The hollow-stem auger was decontaminated between each borehole by means of a steam cleaner.

Sampling rings were wrapped in aluminum foil, capped with close-fitting plastic caps, and sealed with Teflon™ tape. All samples were then labeled, recorded on chain-of-custody forms and placed in a cooler filled with dry ice for storage while in the field and during transport to the laboratory. Soil samples from each borehole were composited at the laboratory so that one sample per borehole was analyzed. Sample numbers identify borehole number and sample depths composited within each sample, i.e., BH-8-1,5,8 identifies borehole location 8 with samples composited at depths of one, five, and eight feet. Composite sampling was used to identify potentially contaminated areas from those that showed no contamination. The sampling plan was not designed to identify specific contaminant depths, contaminant concentrations from individual samples or the lateral extent of any contamination that was identified.

Nine sediment samples were also collected from the Yosemite Canal at a depth of one foot below the sediment surface (see Figure 8 for sample locations). Sediment samples were collected during low tide by means of a hand-held drive sampler loaded with decontaminated stainless steel sampling rings. Upon sample collection, sampling rings were wrapped in aluminum foil, capped, and sealed with Teflon™ tape. All samples were then labeled, recorded on chain-of-custody forms and placed in a cooler filled with dry ice for storage while in the field and during transport to the laboratory.

Samples from the boreholes, monitoring wells and canal sediments were analyzed by a DHS certified laboratory for lead, nickel, copper and chromium, TPH, purgeable organics, including solvents and benzene, toluene, ethylbenzene, and xylene (BTEX) utilizing the EPA Methods listed in Tables 5 and 6.

3.1.3.2 Soil and Canal Sediment Sample Results

A compilation of soil sampling results from the boreholes, monitoring wells and canal sediments is shown in Table 5 with the laboratory reports included as Attachment 4.

Canal sediments showed no significant variation from sample results obtained from the boreholes and monitoring wells. All soil is therefore grouped together and will be discussed as a whole. TPH was detected within all soil samples analyzed and concentrations ranged from a low of six ppm to a high of 2,800 ppm. These results indicate that soils on the site have had wide

TABLE 5.
SOIL AND CANAL SEDIMENT ANALYTICAL RESULTS
(ppm)

COMPOUND (ANALYTICAL METHOD)	DETECTION LIMIT	TTLC	STLC	SOIL BORING SAMPLE NUMBERS																			
				BH-1	BH-2	BH-3	BH-4	BH-5-3	BH-6-2	BH-7-3,5	BH-8-1,5,8	BH-9-1,5,8	BH-10-1,5	BH-11	BH-12	BH-13	BH-14	BH-15	BH-16	BH-17	BH-18	BH-19	BH-20
TPH 2 (418.1)	5	N/A	N/A	600	190	260	***2500***	72	ND	440	310	750	70	6	110	15	850	***2800***	***1100***	44	300	140	56
Methylene Chloride (8240)*	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.009*	ND
Acetone (8240)*	0.010	N/A	N/A	ND	ND	ND	0.013*	0.012*	ND	ND	ND	ND	ND	ND	0.018*	0.015*	ND	ND	ND	ND	ND	ND	ND
Carbon Disulfide (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butanone (8240)	0.010	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.007	ND
Toluene (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3.7	ND	ND	ND	ND	ND
Xylenes, Total (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.010	ND	ND	***57***	ND	ND	ND	ND	ND
Lead, Total (7420)	1	1000	5.0	100	550	230	120	130	160	***1000***	***1100***	50	64	3	31	280	100	21	35	22	130	130	25
Nickel (7520)	1	2000	20	31	520	480	140	16	58	160	170	340	30	25	35	57	66	42	590	130	52	75	1100
Copper (7210)	1	2500	25	95	120	330	22	10	20	***4200***	82	31	51	4.6	13	78	40	19	31	700	31	42	16
Chromium, Total (7190)	1	2500	560	17	110	86	33	24	37	35	40	52	45	22	42	33	11	39	170	62	40	47	59

COMPOUND (ANALYTICAL METHOD)	DETECTION LIMIT	TTLC	STLC	MONITORING WELL SAMPLE NUMBERS						CANAL SEDIMENT SAMPLE NUMBERS								
				MW-1	MW-2	MW-3	MW-4-3	MW-5	MW-6	CS-1	CS-2	CS-3	CS-4	CS-5	CS-6	CS-7	CS-8	CS-9
TPH (418.1) 2	5	N/A	N/A	150	9	30	57	330	570	98	***1200***	68	990	660	360	280	960	***1300***
Methylene Chloride (8240)*	0.005	N/A	N/A	ND	ND	0.011*	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acetone (8240)*	0.010	N/A	N/A	0.023*	ND	ND	0.017*	ND	ND	ND	0.160	ND	ND	0.022*	0.071*	ND	ND	0.027*
Carbon Disulfide (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	0.052	ND	ND	ND	ND	ND	***0.009***	***0.009***
Butanone (8240)	0.010	N/A	N/A	ND	ND	ND	ND	ND	ND	ND	0.046	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene (8240)	0.005	N/A	N/A	ND	ND	ND	ND	ND	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene (8240)	0.005	N/A	N/A	ND	ND	ND	0.005	ND	0.006	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene (8240)	0.005	N/A	N/A	ND	ND	ND	ND	0.010	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylenes, Total (8240)	0.005	N/A	N/A	ND	ND	ND	ND	0.069	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lead, Total (7420)	1	1000	5.0	280	ND<5.0	30	10	220	49	***1300***	420	29	140	470	420	170	200	210
Nickel (7520)	1	2000	20	110	70	55	380	52	50	180	37	21	28	56	550	62	35	41
Copper (7210)	1	2500	25	60	43	630	45	31	29	22	76	17	34	110	140	170	95	74
Chromium, Total (7190)	1	2500	560	48	89	46	210	19	39	41	250	27	42	48	680	65	14	90

"N/A" = Not applicable for that compound. "ND" = Not detected. "TTLC" = Total threshold limit concentration. "STLC" = Soluble threshold limit concentration. *Common laboratory contaminant - the analytical results [for th]is compound should not be considered reliable unless the concentration in the samples exceeds five times the detection limit. Numbers in bold italics exceed TTLC levels, have 10 times higher than drinking [water] action levels, or exceed 1,000 ppm for TPH.

TABLE 6.
GROUND WATER AND SURFACE WATER ANALYTICAL RESULTS
(mg/l)

COMPOUND (EPA ANALYTICAL METHOD)	DETECTION LIMIT	DRINKING WATER ACTION LEVEL	MONITORING WELL SAMPLE NUMBERS						SURFACE WATER SAMPLE NUMBER
			GW-1	GW-2	GW-3	GW-4	GW-5	GW-6	SW-1
Lead (200.7 or 239.2)	0.05/0.005	0.05	***2.3***	ND	0.020	***0.20***	ND	0.020	ND
Nickel (200.7)	0.02	N/A	0.34	0.09	0.46	0.19	0.08	0.29	0.08
Copper (200.7)	0.05	N/A	0.43	ND	0.14	0.09	ND	0.17	ND
Chromium, Total (200.7 or 218.2)	0.02/0.01	0.05	***0.18***	0.013	***0.34***	0.09	0.019	0.06	0.021
Arsenic (206.3)	0.005	0.05	0.032	ND	0.016	0.009	0.007	0.009	0.010
Mercury (245.1)	0.001	0.002	0.001	ND	ND	ND	ND	ND	ND
TPH (418.1)	1	N/A	2	ND	ND	ND	1	ND	ND
Purgeable Organics (624)	N/A	N/A	ND	ND	ND	ND	ND	ND	ND
Phenols, Total (420.2)	0.1	N/A	ND<0.4	ND	ND	ND<0.4	ND	ND	-
PCB's & Pesticides (608)	N/A	N/A	ND	ND	ND	ND	ND	ND	-
Conductivity (at 25°C)	N/A	N/A	6.06 (6.48)	19.8 (>20)	4.48 (4.19)	>20 (>20)	>20 (>20)	>20 (>20)	N/A
pH	N/A	N/A	N/A	6.62 (7.02)	6.85 (6.62)	7.15 (8.06)	6.73 (6.86)	6.70 (7.23)	N/A
Temperature (°C)	N/A	N/A	20.3 (18.7)	17.2 (17.2)	17.7 (18.0)	18.59 (18.6)	16.1 (18.1)	15.9 (17.3)	N/A

Drinking water action levels are established for potentially harmful substances to set concentration limits for long term human consumption. - = Not analyzed. ND = Not detected. Concentrations in bold italics are above drinking water action levels. Ground water sample numbers correspond to monitoring well locations. Conductivity readings = First reading (Last reading). See Attachment 4 for laboratory analyses report dated November 15, 1989.

spread exposure to petroleum contamination. The contaminant is probably heavy petroleum oils (possibly waste oil associated with automobile salvage yards) because little or no volatile contaminants were detected during the soil vapor survey, and volatile organics analyses from the soil samples also showed very low or non-detectable concentrations in most cases as determined by EPA Method 8240. The Regional Water Quality Control Board (RWQCB), the City of San Francisco Health Department, and the DHS were contacted in regard to action levels for which waste oil contamination is considered to be a threat to the environment. None of these agencies would agree to set a cleanup limit for TPH at this time. The DHS has in the past informally designated petroleum concentrations in soils over 1,000 ppm as hazardous waste; however, the agencies generally agreed that the RWQCB had jurisdiction over what the final TPH cleanup level would be for this site. This cleanup level will have to be negotiated with the RWQCB after it has reviewed all data supplied in this, and possibly future, site assessments.

Volatile organic compounds (VOC) were detected in 17 of the 35 samples analyzed. Methylene chloride, acetone, carbon disulfide, and 2-butanone are common laboratory contaminants that can occur at low concentrations during 8240 analyses. If these compounds are found at concentrations up to five times the detection limit, they are generally viewed as suspected of being a laboratory contaminant and have been so indicated in Table 5. The only sample that had concentrations of these contaminants above five times the detection limit was canal sediment sample CS-2. It is unclear whether these concentrations reflect actual on-site contaminant levels or are due to laboratory error.

The VOC's tetrachloroethene, toluene, ethylbenzene, and xylene were also detected within soil samples. These analyses are considered to be valid and representative of on-site soil conditions. In general, these compounds were detected in the low ppb range and are not considered to be an environmental problem. The only exception to this was the sample from borehole BH-15, in which ethylbenzene was detected at 3.7 ppm and xylene at 57 ppm. This borehole also had the highest level of TPH found within any soil sample on the site. Soils from borehole BH-15 were described as having a strong gasoline odor between five and 14 feet and the analytical results are indicative of weathered gasoline as the contaminant. The regulatory agencies will have to determine if these concentrations represent a potential health hazard.

The heavy metals, lead, nickel, copper and chromium were identified in sampling conducted by previous investigators as the metals of concern at the site. All soil and canal sediment samples were therefore analyzed for these elements as shown in Table 5. The table also lists the TTLC and the soluble threshold limit concentrations (STLC) for these metals as listed in Title 22 of the California Code of Regulations (CCR). Title 22 specifies that any substance that exceeds the listed TTLC is designated as a hazardous waste. TTLC values were exceeded at three locations; lead was above the TTLC within boreholes BH-7 and BH-8 and within canal sediment ample CS-1. Copper was above TTLC values within borehole BH-7. Soluble concentrations of the metals were not evaluated for soils during this investigation.

Because lead, nickel, chromium and copper are present to some degree in all soils, metal concentrations below TTLC values are generally evaluated with regard to background concentrations for soils within the surrounding area, as well as these soluble levels as related to STLC limits in CCR Title 22, Section 66699. Little information is presently available concerning background concentrations for these metals in local soils. Chemical analyses from bedrock types similar to those that crop out on the site (Franciscan greenstone) have chromium concentrations reported to be in the range of 13 to 307 ppm and nickel concentrations ranging from nine to 83 ppm (Shervais and Kimbrough, 1987). CH2M Hill, the contractor investigating the Bay Area Drum State Superfund site, reported maximum background concentrations in local soils to be 469, 95.9, 67.1, and 48.7 ppm for lead, nickel, chromium, and copper respectively. These concentrations correspond reasonably well with concentrations found in soils on the site. However, more work is needed to establish actual background concentrations for all metals detected, as well as the soluble metal concentrations as related to STLC limits as specified by CCR Title 22, Section 66699. After solubility tests are made, an evaluation concerning the concentration of metals requiring remedial action, and the extent of soils to be remediated can be made.

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3.1.3.3 Waste Handling and Disposal Procedures

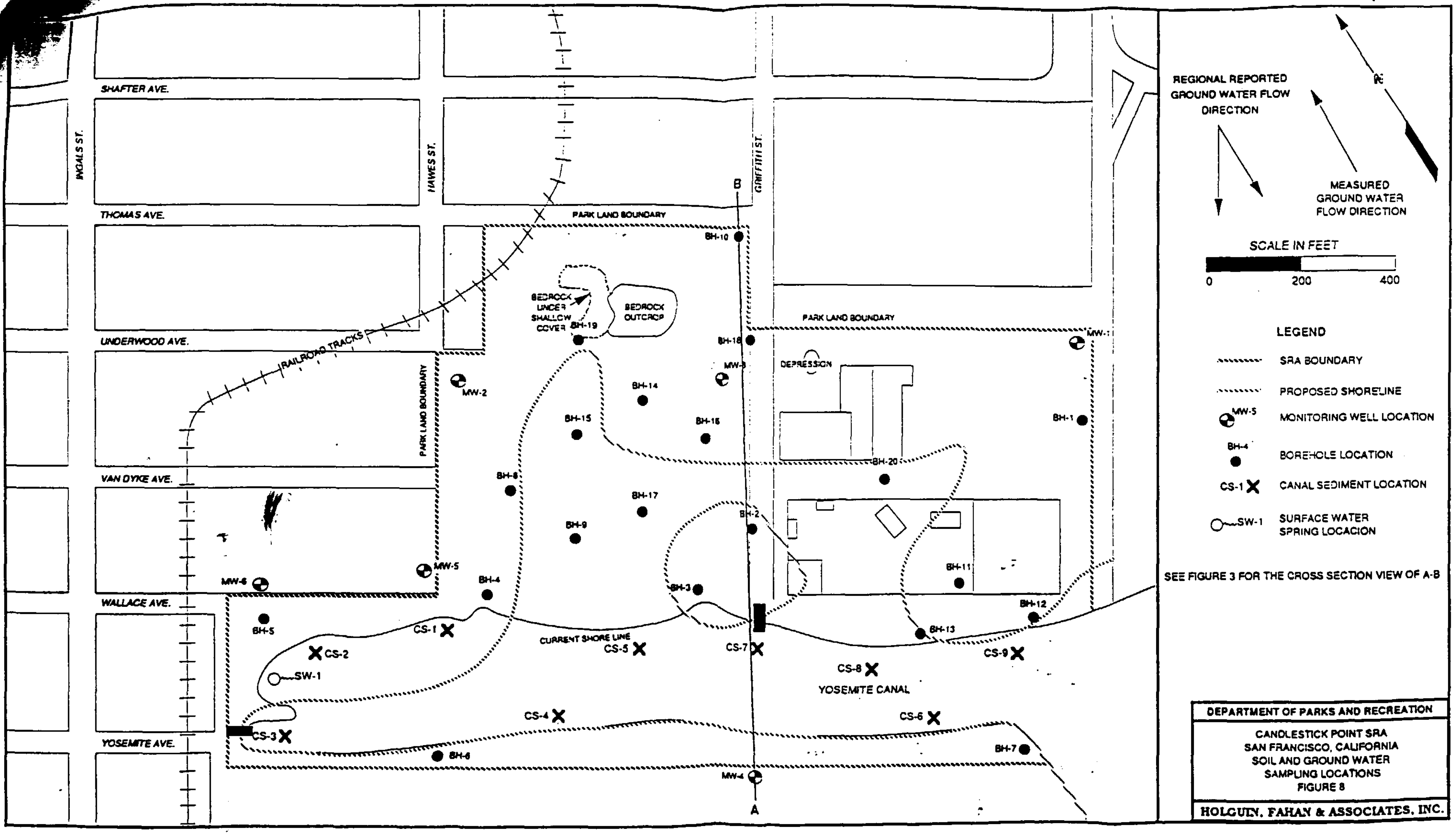
Soil cuttings generated during the drilling of six ground water monitoring wells were placed in 55-gallon Department of Transportation (DOT) 17H drums and stored on site until a determination of their hazardous potential could be made.

Soil borings were drilled with a two-inch diameter hand auger and less than 10 pounds of cuttings were generated from each borehole. Because of the small volume of soil generated at each borehole location, the hand-drilled cuttings were not containerized and instead were left on site at the boreholes.

Soil samples analyzed from the boreholes and monitoring wells showed only locations BH-7 and BH-8 to contain contaminants above California hazardous waste criteria. Soil cuttings from these boreholes were left at the borehole location and were not containerized. Containerized cuttings generated from installation of the six monitoring wells were shown to be non-hazardous and discharged at the site.

3.2 GROUND WATER AND SURFACE WATER ASSESSMENT

On October 10 and 11, 1989, six ground water monitoring wells were constructed around the perimeter of the proposed nature area as shown on Figure 8. Monitoring wells MW-3 and MW-6 were relocated to their present positions from those recommended in the work plan due to


SHAFTER AVE.
THOMAS AVE.
UNDERWOOD AVE.
VAN DYKE AVE.
WALLACE AVE.
YOSEMITE AVE.
INGALS ST.
HAWES ST.
GRIFFITH ST.
RAILROAD TRACKS
PARK LAND BOUNDARY
PARK LAND BOUNDARY
PARK LAND BOUNDARY
BEDROCK UNDER SHALLOW COVER
BEDROCK OUTCROP
DEPRESSION
CURRENT SHORE LINE
YOSEMITE CANAL
A
B
BH-1
BH-2
BH-3
BH-4
BH-5
BH-6
BH-7
BH-8
BH-9
BH-10
BH-11
BH-12
BH-13
BH-14
BH-15
BH-16
BH-17
BH-18
BH-19
BH-20
MW-1
MW-2
MW-3
MW-4
MW-5
MW-6
CS-1
CS-2
CS-3
CS-4
CS-5
CS-6
CS-7
CS-8
CS-9
SW-1
N
REGIONAL REPORTED GROUND WATER FLOW DIRECTION
MEASURED GROUND WATER FLOW DIRECTION
SCALE IN FEET
0
200
400
LEGEND
SRA BOUNDARY
PROPOSED SHORELINE
MW-5 MONITORING WELL LOCATION
BH-4 BOREHOLE LOCATION
CS-1 CANAL SEDIMENT LOCATION
SW-1 SURFACE WATER SPRING LOCACION
SEE FIGURE 3 FOR THE CROSS SECTION VIEW OF A-B
DEPARTMENT OF PARKS AND RECREATION
CANDLESTICK POINT SRA
SAN FRANCISCO, CALIFORNIA
SOIL AND GROUND WATER
SAMPLING LOCATIONS
FIGURE 8
HOLGUIN, FAHAN & ASSOCIATES, INC.

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shallow bedrock obstructions encountered above the water table that prohibited the wells from being installed as proposed. The well locations were chosen to provide the most thorough coverage of both on-site and potential off-site migration of ground water contaminants. One surface water sample was also collected from a spring located at the eastern most end of the Yosemite canal.

3.2.1 Monitoring Well Installation

An eight-inch OD hollow-stem, flight auger was used to drill the monitoring wells to a depth of 20 feet below the first encountered ground water. Cuttings from the wells were logged by a registered geologist, and soils were classified according to the standard USCS. Observations regarding the types and quantities of waste materials encountered and all PID readings of cuttings were logged and recorded on monitoring well logs (see Attachment 2).

Monitoring wells were constructed of two-inch inside diameter polyvinyl chloride (PVC) casing with 0.020-inch perforations extending from the bottom of the hole to three to five feet below the ground surface. Perforations extended at least two feet above the top of the high-tide water depth in the wells to allow for tidal fluctuations. Following the pipe installation, #3 Monterey sand was placed in the well annulus as a gravel pack followed by two to three feet of bentonite and one to two feet of concrete to seal the well from surface infiltration, as well as to support the traffic bearing access box. The design of the wells followed the DHS and State Water Resources Control Board guidance manuals. Detailed construction diagrams are shown in Attachment 5.

3.2.1.1 Ground Water Sample Collection Procedure

The monitoring wells were checked for an immiscible layer, but none was detected. The wells were then developed by pumping with a PVC hand pump until non-turbid ground water was produced. The wells were allowed to recharge and were then purged an additional four to seven well volumes prior to extracting a sample representative of the in-situ ground water conditions. During the purging process, the conductivity and temperature of the produced water were constantly measured (see Attachment 6 for the water sample logs). Purging continued until the measured parameters had stabilized, at which time ground water samples were collected. Produced ground water was stored on site in 55-gallon drums.

A decontaminated Teflon™ bailer was used to sample the wells. Ground water samples were placed in decontaminated containers with the appropriate preservatives, which were supplied by the analytical laboratory. The samples were labeled, sealed, and recorded on chain-of-custody forms and placed in a transport container that was filled with Blue-Ice™ for cooling purposes while in the field and during transportation to the laboratory. Samples were tested for metals, including lead, nickel, copper, chromium, arsenic, mercury; for organochlorine pesticides and PCB's by EPA Method 603; for total recoverable petroleum hydrocarbons by

EPA Method 418.1; for purgeable organics, including solvents and benzene, toluene, ethylbenzene, and xylene (BTEX) by EPA Method 624; and for total phenols by EPA Method 420.2.

3.2.2 Surface Water Sampling Procedures

The only surface water observed at the site, other than San Francisco Bay water, was from a spring located at the eastern end of the Yosemite Canal (see Figure 8 for spring location). The spring was located below the high-tide level of the canal, and has been observed flowing throughout the year by one of the DPR employees (Daniel Dungy, DPR Ranger). Sewer discharge was not sampled as the local Publicly Owned Treatment Works regularly samples and regulates this discharge.

The spring water was sampled at low tide so that the spring was exposed to the atmosphere. Samples were collected by allowing the spring water to run directly into sample containers with as little agitation as possible. Sample containers were supplied by the analytical laboratory and contained the appropriate preservative for each particular analysis. Surface water samples were labeled, sealed and recorded on chain-of-custody forms. The samples were placed in a transport container that was filled with Blue-Ice™ for cooling purposes, and were transported to a DHS certified laboratory for analysis. Surface water samples were analyzed for the same constituents as the ground water samples with the exception of phenols, PCB's and pesticides (EPA Methods 420.2 and 8080).

<u>3.2.2.1 Ground Water and Surface Water Sample Results</u>

The results of ground water sampling are shown in Table 6 and laboratory reports are included in Attachment 4.

The water analyses showed no pesticides, PCB's, phenols or purgeable organics to be present within ground or surface waters sampled at the site. Low concentrations of total petroleum hydrocarbons (one to two ppm) were found in water samples from monitoring wells MW-1 and MW-5 (samples GW-1 and GW-5). These samples did not have any purgeable organics associated with the TPH concentrations, indicating that the TPH concentrations are probably due to the leaching of waste oils that were found in most soils sampled at the site.

Chemical analyses for the heavy metals, lead, nickel, copper, chromium, arsenic, and mercury were also conducted for both surface and ground water samples. The water analyses showed low concentrations of most of the metals to be present in all samples. Metal concentrations were above drinking water action levels for lead in monitoring wells MW-1 and MW-4, and above action levels for chromium in wells MW-1 and MW-3. Arsenic and mercury concentrations were below drinking water action levels in all wells, and no drinking water action levels exist for the metals nickel or copper. The surface water sample showed no metal concentrations above drinking water action levels.

Drinking water action levels are established by the DHS for potentially harmful substances and are used to set concentration limits for which long term human consumption is considered safe. These criteria may not be the appropriate standard for evaluating dissolved metal concentrations in ground water at this site. They are referenced here only because they give a conservative indication of limits that may be applied to ground water by regulatory agencies. Applicable action levels for ground water are determined on a case by case basis by the RWQCB and are based on background concentrations of metals in ground water within the area, the quality and potential usages of the area wide ground water, and the potential impact of the dissolved metals on the health and or environment of the area. Metal concentrations above which remedial actions will be required will have to be negotiated with the RWQCB.

3.2.2.2 Disposal of Containerized Ground Water

Approximately 120 gallons of ground water purged from the six on-site monitoring wells were stored on site in 55-gallon DOT drums. After laboratory analyses showed that the ground water was non-hazardous, the RWQCB and the City of San Francisco Public Works Department, Industrial Waste Division were contacted about disposal of the water through the City sewer system. Both agencies agreed that the water could be sent through the sewer system, and it was therefore disposed of in this manner.

4.0 SUMMARY OF FINDINGS AND DISCUSSION

This study was commissioned by the DPR in order to identify and characterize the contaminants present on the site, to identify potential environmental problems associated with the creation of the proposed wetlands, to evaluate the costs associated with excavation and removal of soil and sediment from the site, and to evaluate the overall feasibility of establishing a wetlands given the chemical characteristics of subsurface soil and ground water at the site. Each of these objectives has been addressed in turn.

4.1 IDENTIFY AND CHARACTERIZE CONTAMINANTS PRESENT AT THE SITE

The primary contaminants identified during this study were heavy metals and TPH in the canal sediments and in soils located throughout the site. Lead concentrations in soils and canal sediments measured greater than 50 mg/kg (10 times the STLC level) in 22 of the 29 soil and sediment samples collected. Lead concentrations exceeded TTLC levels (1,000 mg/kg) in three of the samples, thereby establishing these samples as hazardous waste. TTLC levels for copper were also exceeded in one of the three samples.

TPH was detected in all soil samples analyzed on the site and, in all but one instance, it was probably due to waste oils and/or other heavy, non-volatile petroleum products.

TPH exceeded 100 ppm in 23 of the 35 samples analyzed and exceeded 1,000 ppm in five of these samples.

At this time it is not clear how these contaminants found their way onto the site. Three possibilities are:

1) They could have been incorporated within the fill materials prior to their being placed on site;

2) They could be the result of on-site dumping or be the result of discharges by on-site facilities; or

3) They could have migrated from an off-site source.

The most likely hypothesis is that the contamination is primarily due to on-site activities or was previously incorporated within the fill materials. Off-site sources may have contributed to the contamination, but because heavy hydrocarbons and lead are not very mobile under most environmental conditions, and because of the widely dispersed contaminant locations and the lack of any identifiable plume or pattern, contamination from off-site sources is probably minor.

It is also unclear at this time the concentration at which the regulatory agencies will require cleanup of metals and TPH. Potentially, all dredged material could be considered hazardous and require special handling and disposal at costs up to $300 per cubic yard. Cleanup levels for metals and TPH will first have to be negotiated with the regulatory agencies and a more detailed study conducted, which delineates the areal extent and depth of the contaminants, before any reasonable estimate of costs associated with the excavation and disposal of dredge materials can be made.

Regulatory agencies that will be responsible for establishing the contaminant action levels will be the RWQCB, the DHS, and the City of San Francisco Health Department, in accordance with the Maher Ordinance.

4.2 IDENTIFY POTENTIAL ENVIRONMENTAL PROBLEMS ASSOCIATED WITH THE CREATION OF THE PROPOSED WETLANDS

The environmental problems that have been identified to date are elevated heavy metal and heavy hydrocarbon concentrations in the soil, sediment, and ground water at the site. These contaminants could have two impacts on the creation of the proposed wetlands. First, the soluble component of the heavy metals could contribute to a biocidal effect on the microorganism community that must develop at the site in order to have a viable wetlands, thereby restricting the recolonization of the wetlands to those organisms that are able to withstand the present environmental conditions. Secondly, the regulatory requirements associated with the remediation of contaminants in soils and ground water at the site may make the creation of the proposed wetlands cost prohibitive.

4.3 EVALUATE THE COSTS ASSOCIATED WITH EXCAVATION AND REMOVAL OF SOIL AND SEDIMENT FROM THE SITE

The cost for remediating the contaminants identified by this study cannot be estimated at this time for the following reasons:

1) The level of hydrocarbons and heavy metals at the site could be considered high enough to require cleanup by the RWQCB or the DHS. However, cleanup levels are set on a site by site basis and are based on background concentrations in the area, the depth to and uses of ground water in the area, and the health sensitivity of the area. Until it is known whether the regulatory agencies will require cleanup of the contaminants identified at the site, and until action levels are established, it is not possible to estimate cleanup costs.

2) The sampling for this preliminary assessment was designed to screen the site for possible contamination. Sampling was therefore conducted on a systematic basis with a sample spacing of approximately 150 feet. This sample frequency is not fine enough to delineate the boundaries of any identified contamination. A meaningful estimate of the cost to mitigate the contamination must therefore await a more detailed assessment.

3) Heavy metal concentrations that could exceed the STLC's have been identified in 22 of the 29 soil and sediment samples collected at the site. Until solubility tests, conducted in accordance with CCR Title 22, Section 66700, have been performed on soil and sediment samples, the volume of material that exceeds these levels is unknown. STLC's of the soils will be required by the regulators before they can establish site cleanup action levels.

4.4 EVALUATE THE OVERALL FEASIBILITY OF ESTABLISHING A WETLANDS GIVEN THE CHEMICAL CHARACTERISTICS OF SUBSURFACE SOIL AND GROUND WATER AT THE SITE

Based on the current available information, it is not possible to estimate the feasibility of establishing a wetlands at this facility. Additional studies, as outlined below, will be required.

5.0 CONCLUSIONS AND RECOMMENDATIONS

High concentrations of heavy metals and TPH were found in soil samples collected throughout the site and appear to the primary concern identified by this study. Ground water and surface water appeared to have been impacted, but dissolved contaminant concentrations were generally found to be low and probably will not significantly impact the establishment of a wetlands in this area. The next phase of the investigation should therefore concentrate on establishing background levels for the area, establishing action levels with the regulators, and determining the limits of the soil contamination on the site.

Recommendations for additional work include:

1) Establish naturally occurring background levels for metals in the bedrock that crops out at the site, in fill materials that have been used in other parts of San Francisco Bay, and in naturally occurring soils developed on similar types of bedrock;

2) Establish naturally occurring metal concentrations in shallow ground water wells in other parts of the City of San Francisco;

3) Determine the constituent makeup of the hydrocarbon contamination detected throughout the soil, sediment and ground water at the facility through additional testing;

4) Determine the lateral and vertical extent of the contamination identified during this study by further soil sampling;

5) Negotiate action levels with the RWQCB and the DHS for the identified contaminants;

6) Evaluate the costs for disposal of excavated materials after action levels have been established and the areal and vertical extent of contamination has been mapped and its volume calculated; and

7) Determine through literature research, if possible, or microcosm studies, if necessary, if the levels of organics and heavy metals will impact the recolonization of the wetlands by microorganisms.

The costs associated with completing this next phase of the investigation are estimated to be $50,000 to $75,000.

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ENVIRONMENTAL MANAGEMENT CONSULTANTS

ATTACHMENT 1

LIST OF REFERENCES

LIST OF REFERENCES

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Harding Lawson Associates

June 11, 1986

17,830,001.04

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Dear Mr. Ricci:

Observations and Testing
Underground Tank Removal
Yosemite Avenue and Ingalls Street
San Francisco, California

This letter presents the results of our observations and sampling conducted during the removal of two underground gasoline storage tanks located in the lumber yard on the south corner of Yosemite Avenue and Ingalls Street. Our scope of services was to observe and document both the physical condition of the tanks and the subsurface conditions encountered within the two excavation, and to obtain soil and water samples.

OBSERVATIONS DURING TANK REMOVAL

Two gasoline storage tanks were excavated from the site on May 23, 1986 including one 1,000-gallon capacity gasoline tank (Tank 1) located approximately 25 feet northeast of the lumber yard building and one 2000-gallon capacity gasoline tank (Tank 2) located approximately 134 feet southeast of Tank 1. Tank locations are shown on Plate 1. Our field geologist was present to observe the tanks as they were removed, to note the soil conditions encountered in the excavation, and to obtain samples of soil and water.

Tank 1 is at least 10 years old but was reportedly not in service for about the last 3 years. The tank is of single-walled steel construction and no cathodic protection devices or protective outer coating were observed. The exterior of the tank showed indications of scaling and

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Ref. # 19

corrosion and a small hole (less than 1/4-inch in diameter) was noted near the bottom of the tank toward the south end. The hole appeared to be the result of deterioration of the tank (corrosion) as opposed to damage to the tank during removal. Tank 1 was covered by about 3-1/2 feet of backfill and the surface was covered with asphalt paving. The lower portion of the tank was supported in a concrete cradle or box structure. The backfill consisted of a fine to coarse brown sand with occasional gravels. Water was encountered in the tank excavation at a depth of about 3-1/2 feet below the surface. A sheen was noticed on the surface of the water. The soil outside of the excavation backfill was heterogeneous fill material and contained debris such as glass, organic matter, and metal (including an old water heater).

Tank 2 was installed in about 1983. The surface of the tank was coated with a tar-like substance which appeared to be in good condition. The tank was observed to be in good condition with no significant rusting or scaling. The tank was surrounded by brown sandy backfill and was overlain at the surface by asphalt paving. No odors were noticed during the excavation. Ground water was encountered at a depth of about 5 feet below the surface. There was a slight sheen on the water.

SAMPLING AND TESTING

Soil and water sampling was performed following the procedures described in the California Regional Water Quality Control Board's (RWQCB) guidelines. One soil sample was collected from each excavation at a depth of 3 feet below the excavation floor (below water) from the filler end of each tank. The samples were obtained from the backhoe bucket and were collected in stainless steel tubes which were covered with aluminum foil, capped, sealed, and placed in a cooler for delivery to an analytical laboratory. One water sample from each of the excavations was obtained with a stainless steel bailer. Each water sample was decanted into a volatile organic analyses bottle and was also sealed and stored on ice for delivery to the laboratory. All samples were accompanied with chain-of-custody forms.

Laboratory testing was performed by Analytical Science Associates in Emeryville, California. The soil and water samples were tested for hydrocarbons (gasoline) in accordance with the procedures outlined by the RWQCB. The results of the chemical testing are attached.

CONCLUSIONS

A hydrocarbon sheen, detectable dissolved gasoline in the water and soil containing gasoline were encountered in both tank excavations. However, only Tank 1 had visible signs of a historic leak. The hydrocarbons detected around Tank 1 may have originated from the hole in the tank, historic spillage during overfilling, or a discrete source within the debris fill surrounding the tank. The sheen and the hydrocarbons detected in the soil and water at the east tank most likely originated from historic overfilling or possibly a source within the surrounding fill. The fill in this area contains random construction debris which may include hydrocarbon products dumped many years ago during reclamation of the site from San Francisco Bay. No potentially recoverable free product was noted.

If you have any questions regarding our observations and testing, please call.

Yours very truly,

HARDING LAWSON ASSOCIATES

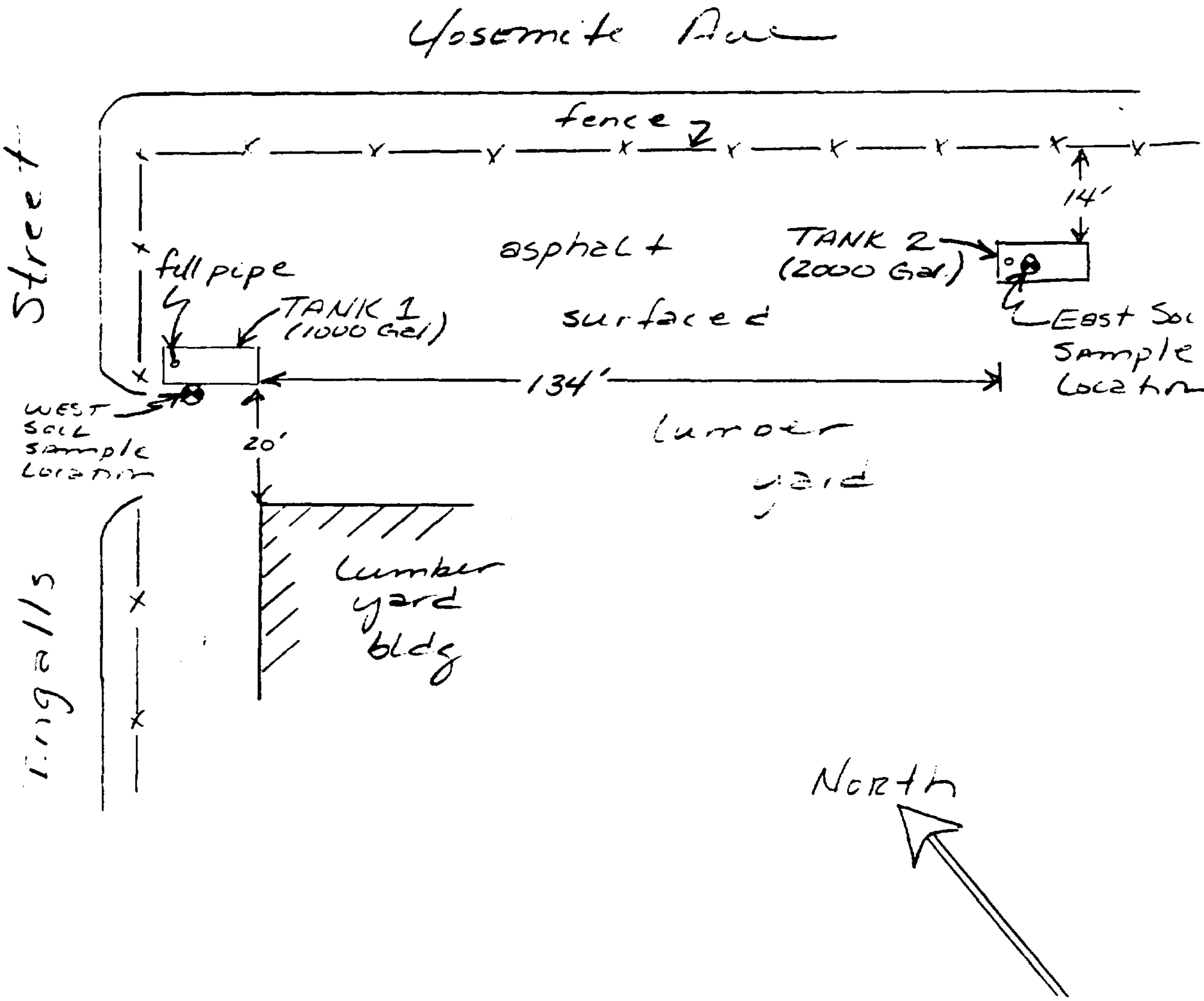
Steve WH Waller for
CEG 1294
Donald G. Gray
Civil Engineer

REGISTERED PROFESSIONAL ENGINEER
DONALD G. GRAY
25220
12-31-89
EXPIRES
CIVIL
STATE OF CALIFORNIA

DGG/SEP/bt

Attachments: Plate 1 - Site Plan
Plate 2 - Laboratory Test Results

2 copies submitted



Legend

● Soil Sample location at a depth of 3 feet below excavation floor

0 30 60 feet

SCALE

Harding Lawson Associates
Engineers, Geologists & Geophysicists

Site Plan
1295 Yosemite Ave
San Francisco, Calif.

PLATE 1

DRAWN	JOB NUMBER	APPROVED	DATE	REVISED	DATE
	17000 E30,001.04	SEP	6-11-86		

ANALYTICAL SCIENCE ASSOCIATES, Inc.
475 EL ALAMO • DANVILLE, CA 94526 • (415) 820-9058 • (415) 547-6390

HLA PROJECT NO. 17000,830,001.04
JUNE 6, 1986
REGINALD RECCI
ATTENTION: DIANA DICKERSON

DATE SAMPLED: 5/23/86

	TOTAL HYDROCARBON* ppm
EAST SOIL	110
WEST SOIL	500
DETECTION LIMIT FOR SOILS	10 ppm
EAST WATER	100
WEST WATER	88
DETECTION LIMIT FOR WATER	1 ppm

*AS GASOLINE

All values in ppm.

Signed: William Prater
William Prater
Senior Scientist

REPORT ON SITE CHARACTERIZATION
E.S. BRUSH AND SONS LUMBER
1313 ARMSTRONG AVENUE, SAN FRANCISCO

December 1987

INTRODUCTION

Messrs. Brush, the owners of E. S. Brush and Sons Lumber on 1313 Armstrong, have retained BASELINE ENVIRONMENTAL CONSULTING to perform a site characterization of the subject property. The purpose of the work is to identify the past land uses on the site and the potential for these land uses to have affected the subsurface.

SITE LOCATION

The site is located in the southwestern portion of the City and County of San Francisco on 1313 Armstrong Avenue. The site is bounded to the northeast by Armstrong, to the southeast by Hawes, to the southwest by Bancroft, and to the northwest by a vacant lot abutting Ingalls; Figure 1 shows the regional site location.

SITE HISTORY

The site has been operated by E. S. Brush and Sons as a lumber yard from 1960 to 1987, when the lumber yard was closed. The site was used for the storage of lumber. The lumber was brought onto the site either as "raw" lumber or as treated lumber. Lumber was never treated on-site; these activities were carried out by the sellers of wood to Brush Lumber. Appendix A contains statements from previous employees at Brush Lumber (spanning a period from 1960 through 1987) indicating that creosote or creosote products were never used or stored on the site.

Figure 2 shows the existing structures on the site. These structures consist of: a) a warehouse, used for storing lumber; b) an office; and c) two storage sheds used for storage of tools during the operation of the lumber yard. All structures but the office, are currently vacant.

Prior to 1960, the site was operated by A.D. Schader Company for rail-related activities. Railroad tracks extended onto the site (according to a map by the Southern Pacific Company, dated 13 April 1954). It appears that the railroad tracks extended into a structure, located at the eastern corner of the site (Figure 2).

Ref. #20

In 1944 (map of A.D. Schader Company, dated 1944) the site contained railroad tracks traversing the site, a blacksmith shop, a shop, a tool storage area, and a blacksmith shed (see Figure 2).

To ascertain the previous land uses on the site, an archival search was conducted of Sanborn Fire Insurance Maps at the Assessor's Office of the City and County of San Francisco. Maps from the project area from 1913, 1914, 1915, 1923, 1929, 1943, 1949, 1950, 1959, 1965, and 1966 were reviewed. No activities are indicated on the site until the 1966 map update; structures listed on the site at that time confirm the structures currently on the site and described above. Specific activities on the site occurring prior to E.S. Brush and Sons operating the site as a lumber yard are unknown from record searches conducted.

According to data from the Section 20 of the City and County of San Francisco Municipal Code, the 1868 shoreline of the San Francisco Bay was located immediately east of the project site, as shown on Figure 2. Soil sampling activities implemented as part of this report preparation indicates that the site is underlain by artificial fill and Bay mud at depths ranging from four to ten feet. The nature of the fill material is likely to change in quality over short distances. On the basis of the 1944 map from A.D. Schader Company, the site had been filled at that time. It is unknown at which time filling occurred at the site, but it would at least have to have been prior to 1944, and may have been associated with filling operations occurring in the area as part of the filling of the Hunter's Point area by the United States Navy during the initial phases of World War II.

OFF-SITE SOIL AND GROUNDWATER INVESTIGATIONS

In November 1986, the consulting firm of ERM West collected soil samples and water samples for the City and County of San Francisco in the vicinity of the site. The work was carried out in connection with the construction of an underground transport facility. Sampling locations are shown on Figure 3. Seven soil sampling locations are located on Armstrong Avenue and four soil sampling locations are located on Hawes Street. Three monitoring wells were also installed near the site, as shown on Figure 3. Data submitted by ERM West to the City (ERM West 1987, 1987a, 1987b) have been reviewed. The data presented in the reports are incomplete and inconclusive as to location and source of compounds identified in the subsurface adjacent to the site. Below (Table 1) is a description of the soils and water data available from the ERM West reports. Analyses were performed on soil and water samples from locations 7, 7A, 8, and I. In addition, conversations with ERM West staff (Melita Elmore and Dan Cutugno, personal communications) indicate that the soil borings adjacent to the site along Armstrong Avenue were not sampled, but rather were visually inspected for soil discoloration and floating product on the groundwater table.

The analytical results indicate that contamination by organic compounds has occurred in the subsurface at Location 7A (Figure 3) (a soil sample was also collected at Location 7 and analyzed for creosote and pentachlorophenol; no compounds were identified above detection limit of 10 mg/kg). The soils at location 7A were analyzed for TPH and contained 680 mg/kg.

Water from the open borehole at location 7A was sampled and analyzed for BTX and PNA's; a total of 8.35 mg/L of PNA's were detected in the water; BTX and 1,1 dichloroethene and 1,1 dichloroethylene were also identified above detection limits. Analytical data from soil samples

TABLE 1

OFF-SITE SOIL AND GROUNDWATER DATA AVAILABILITY
Near E. S. Brush and Sons Lumber

Location	Soils Data	Water Data	Chemical Analyses	Comments
7	Yes	No	Creosote Pentachlo- rophenol Metals	
7A	No (?)	Yes	TPH BTX PNA	Grab sample from open borehole
8	Yes	No	BTX Creosote Pentachlo- rophenol Metals	
I	Yes*	Yes*	BTX TPH	
T	No (?)	Yes	PNA	
U	No	No		Visual observations
V	No	No		Visual observations
W	Yes	Yes	PNA	
X	No	No		Visual Observations
Y	No	No		Visual observations
Z	No	No		Visual observations
OW1	Yes	No (?)	TPH PNA	
OW2	Yes	No (?)	TPH PNA	
OW3	Yes	No (?)	TPH PNA PCB	

(continued)

Table 1 (concluded)

Notes:
Source of data: ERM West laboratory reports and reports (1987, 1987a)
TPH = Total Petroleum Hydrocarbons
BTX = Volatile organic compounds by EPA Method 8020
PNA = Polynuclear aromatics
* = Analytical results from the water and soil samples are identical; it appears that errors have occurred, either in the laboratory or in the reporting.

collected at monitoring well locations OW-1, OW-2, and OW-3 (see Figure 3 for locations) were analyzed for TPH, PNA's and PCB (at location OW-3). The highest concentrations of petroleum hydrocarbons and PNA's were found at OW-3, furthest away from the site.

Soil samples from Locations 7 and 8 were also analyzed for inorganic constituents (metals). A shallow soil sample from Location 7 exceeded the California Administrative Code Title 22 criteria for hazardous waste for zinc; all other samples were below this threshold level.

FIELD ACTIVITIES AND OBSERVATIONS ON SITE

In response to the investigations performed by ERM West, BASELINE developed and implemented a sampling program on the site to assess if past on-site land uses had affected the subsurface. Soil samples were collected from ten locations on the site with a hollow-stem auger drill rig; all augers had been steam-cleaned prior to sampling activities. The samples were collected from a California Modified sampler with 6-inch brass sleeves; all sampling equipment was decontaminated between each sampling event with TSP and deionized water. After sample collection, the samples were sealed with aluminum foil, taped, placed in a zip-lock bag, refrigerated, and brought to the laboratory for analysis. Proper chain-of-custody procedures were followed.

From each sampling location, two soil samples were collected from different depths and composited in the laboratory (except Location 3, where one sample was collected and analyzed). All samples were collected in the unsaturated zone ranging in depths from 2 to 6.5 feet. During sampling activities, no odor or soil discolorations were observed at any of the sampling locations. At all locations, the boreholes were advanced into the saturated zone to ascertain if floating product were present on the shallow groundwater. No floating product or petroleum-related sheens were identified in the groundwater.

Logs from each borehole are included in Appendix C. On the basis of field observations, the site appears underlain by artificial fill materials. Groundwater was encountered at depths ranging from 5 to 6.5 feet below ground surface. Bay muds were encountered at depths ranging from four to ten feet from the ground surface.

Unrelated to the work undertaken by BASELINE, one underground fuel storage tank was removed from the site. The former tank was located between the existing warehouse and storage shed (see Figure 2). An unauthorized release was discovered during tank removal activities; as a result, a groundwater monitoring well was installed adjacent to the former tank location. A groundwater sample was collected by the contractor and analyzed for BTX; no compounds were identified above detection limits.

ANALYTICAL RESULTS

All samples were analyzed for total petroleum hydrocarbons. Samples from two locations along the property boundary along Armstrong Avenue (locations 1 and 3) and one location at the center of the site (Location 5) were also analyzed for PNA's, creosote-related compounds. Table 1 summarizes the analytical results, and Appendix C contains the laboratory reports. Petroleum hydrocarbons were identified at locations 2, 4, and 5 (Figure 3), and PNA's were identified at Location 1.

TABLE 2

SUMMARY OF ANALYTICAL RESULTS
BRUSH LUMBER COMPANY
SAN FRANCISCO

Location	TPH (mg/kg)	PNA's (total) (mg/kg)	Comments
1	<10	2.2	Composite of 2 samples
2	180	NA	Composite of 2 samples
3	<10	<0.1	
4	160	NA	Composite of 2 samples
5	83	<1	Composite of 2 samples
6	<10	NA	Composite of 2 samples
7	<10	NA	Composite of 2 samples
8	<10	NA	Composite of 2 samples
9	<10	NA	Composite of 2 samples
10	<10	NA	Composite of 2 samples

Notes:

For sampling locations, refer to Figure 3.
Laboratory reports are contained in Appendix C.

CONCLUSIONS

The record search performed for the site and the results of soil sample collection and chemical analytical results indicate the following:

1. The site was located at the margin of the San Francisco Bay shoreline in 1868. Sometime between 1868 and 1944, the level of the ground surface on the site was raised to its present elevation by emplacement of artificial fill on Bay mud. On the basis of data from on-site soil borings, it appears that the fill vary in thickness from four to ten feet; with the greater thickness toward the Bay east of the site.

2. Groundwater was encountered in the boreholes above the level of the Bay mud, at depths below the ground surface ranging from 4.0 to 6.5 feet.

3. Soil samples were collected in ten locations where previous land uses could possibly have affected the quality of the subsurface and near areas where soil samples had previously been collected as part of the City and County transport facility construction. The soil samples were collected in the unsaturated soil column, including immediately above the groundwater table. During soil sample collection, boreholes were advanced into the groundwater table to ascertain from visual observations if the groundwater contained petroleum-related compounds. No visual indications of petroleum-related compounds were observed. The soil samples were analyzed for total fuel petroleum hydrocarbons; in addition, three soil samples were analyzed for polynuclear aromatic hydrocarbons (creosote-related compounds). Three sampling locations (2, 4, and 5) contained petroleum hydrocarbons, ranging in concentrations from 83 to 180 mg/kg, and one sample contained polynuclear aromatics with a total concentration of 2.2 mg/kg.

4. The concentrations of organic compounds identified from the soil sampling activities on the site are below regulatory threshold levels for identifying a material as hazardous waste (CAC Title 22).

On the basis of the data collected during field activities and the record search performed, there is no evidence that the activities associated with E.S. Brush and Sons lumber yard have affected the quality of the subsurface materials in the unsaturated zone.

REFERENCES AND PERSONS CONTACTED

Cutugno, Dan, 1987, ERM West, environmental specialist, personal communication.

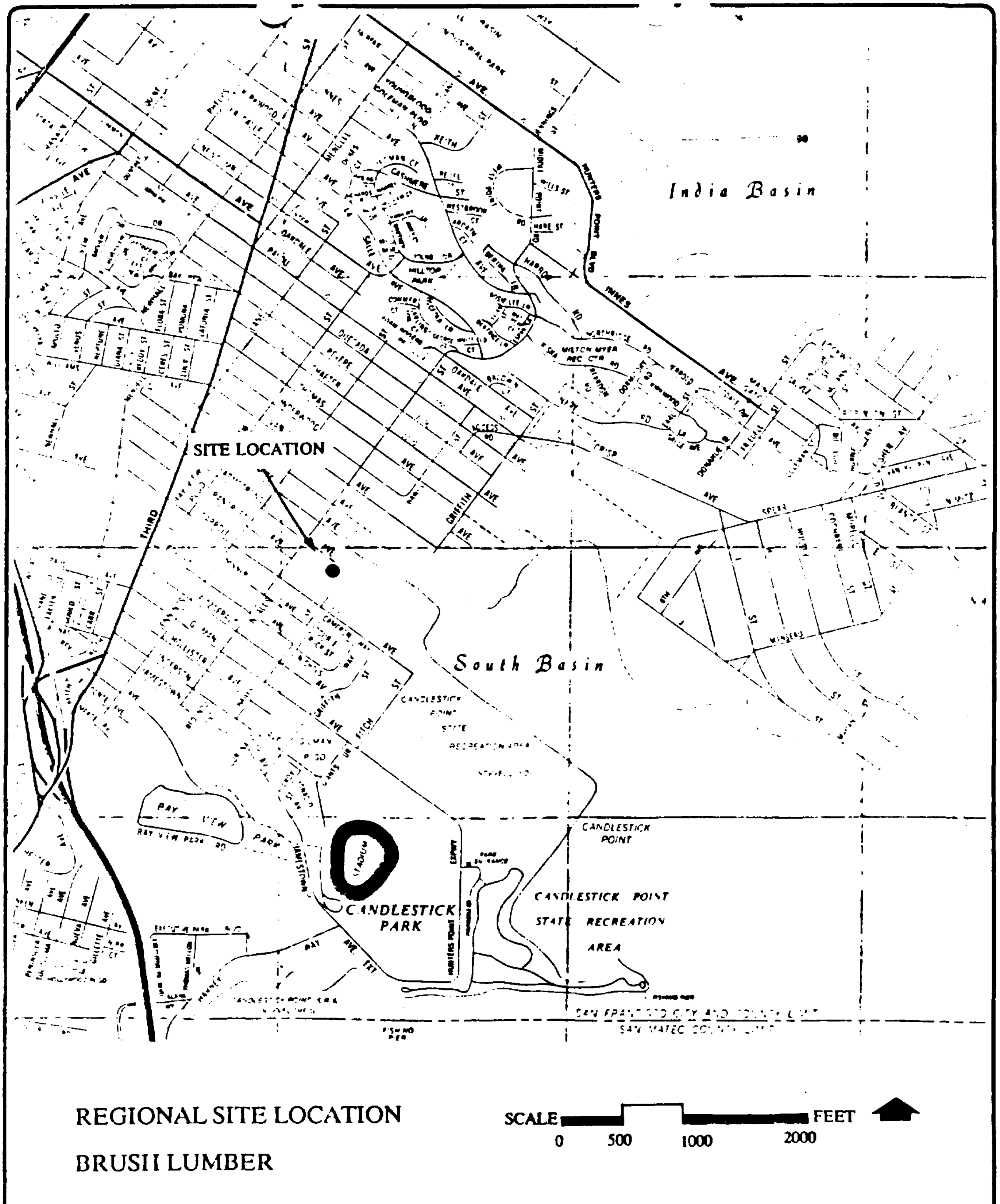
Elmore, Melita, 1987, environmental specialist, ERM West, personal communication.

ERM West, 1987, Yosemite and Fitch Outfalls Consolidation Project: Soil Investigation alonf the Route of Proposed Sewer Construction; prepared for the City and County of San Francisco, 16 January.

ERM West, 1987a, Draft Site Mitigation Plan, Yosemite Outfall Product; prepared for the City of San Francisco, Department of Public Works, 27 March 1987.

Medberry, Steven, 1987, Engineer, City and County of San Francisco, personal communication.

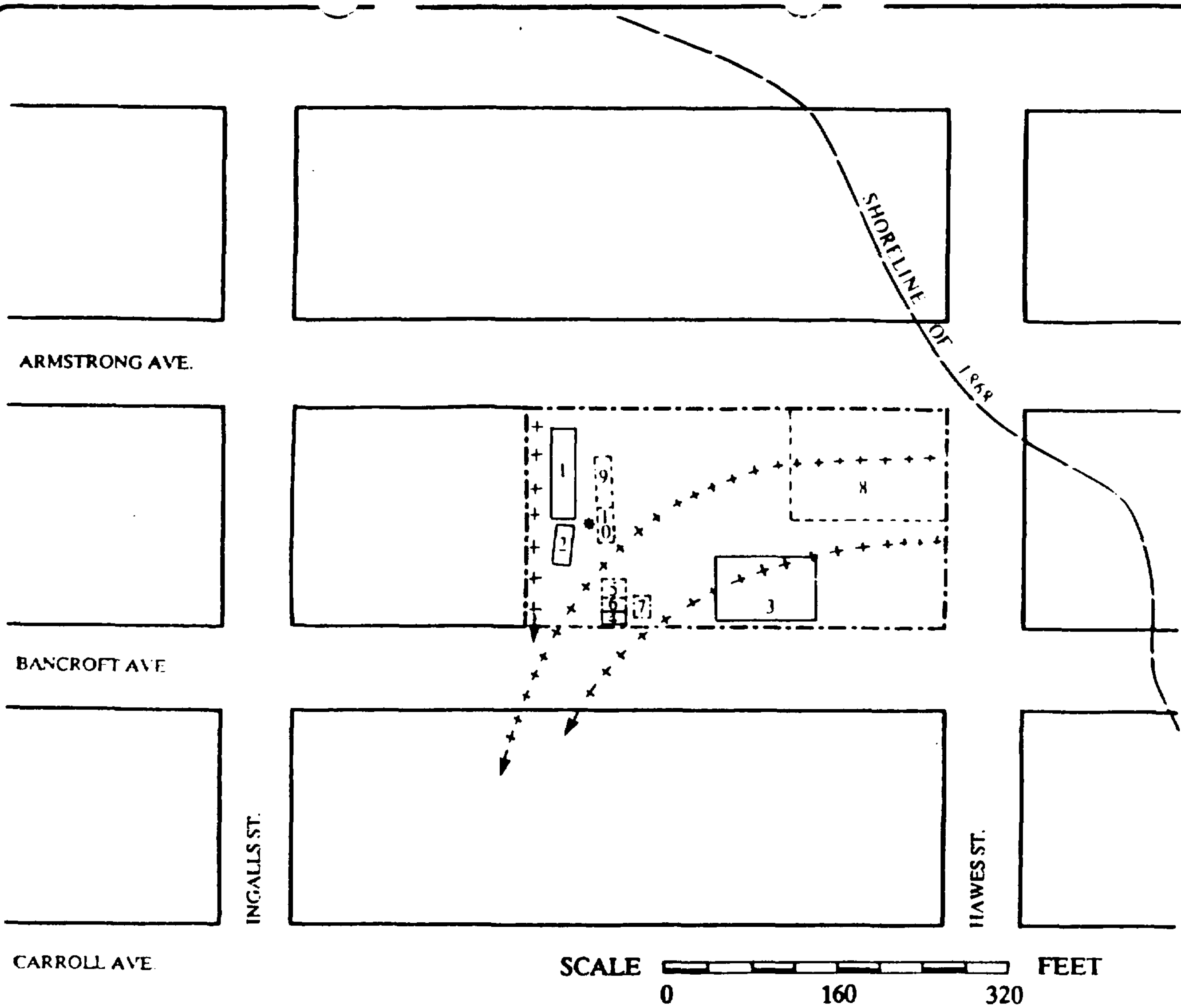
Sanborn Fire Insurance Maps, 1913, 1914, 1915, 1923, 1929, 1943, 1949, 1950, 1959, 1965, and 1966, at San Francisco Assessor's Office



REGIONAL SITE LOCATION

BRUSH LUMBER

FIGURE 2



CURRENT AND PAST LAND USES

ON SITE STRUCTURES

RAILROAD TRACKS

EXISTING BUILDINGS

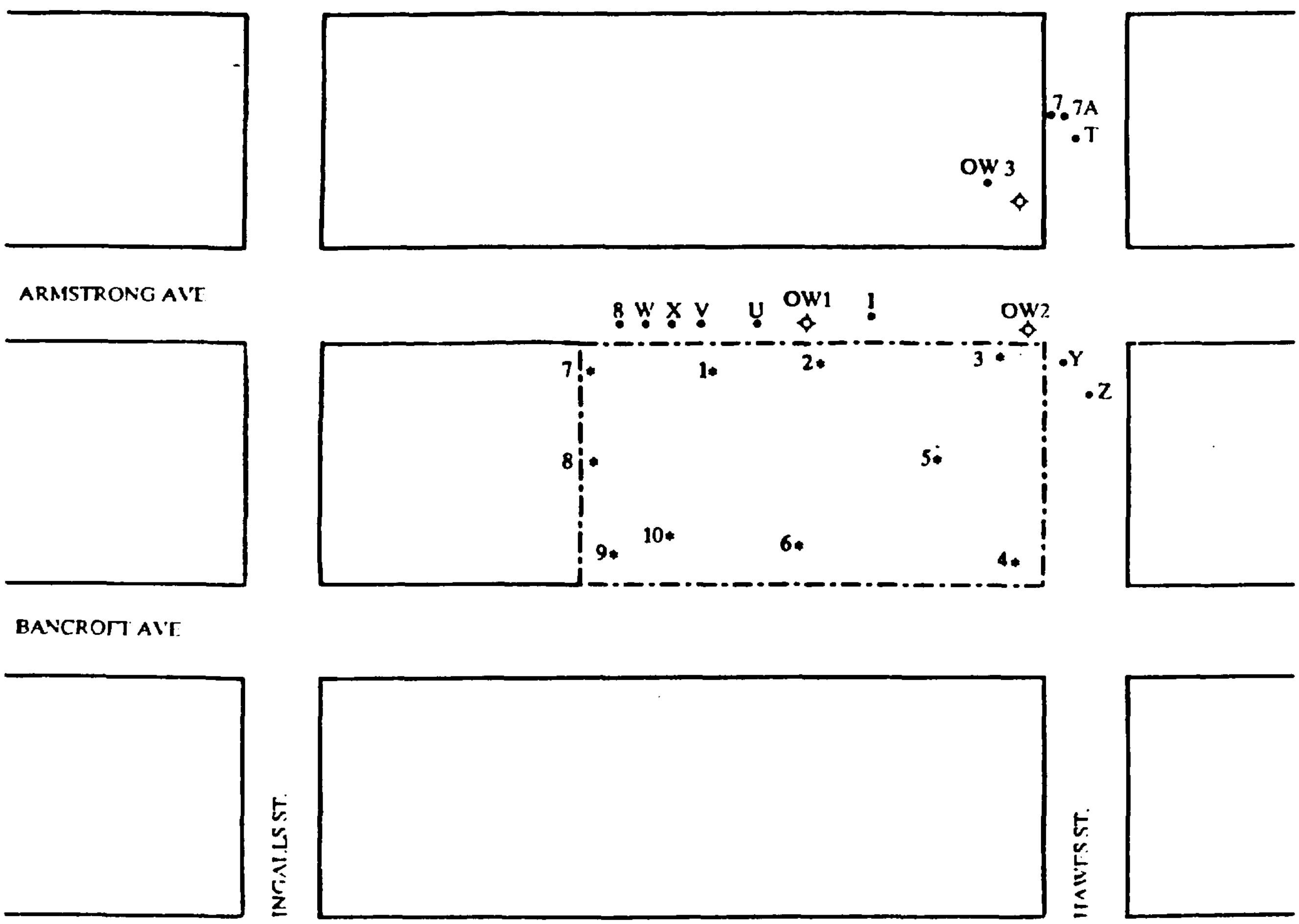
1. WAREHOUSE
2. STORAGE
3. WAREHOUSE
4. OFFICE

PAST BUILDINGS

5. BLACKSMITH
6. SHOP
7. PARTS HOUSE
8. RAILROAD SHED (?)
9. STORAGE
10. TOOL HOUSE

✸ FORMER LOCATION OF UNDERGROUND FUEL STORAGE TANK AND APPROXIMATE LOCATION OF GROUNDWATER MONITORING WELL

FIGURE 3



SOIL AND GROUNDWATER SAMPLING LOCATIONS

N

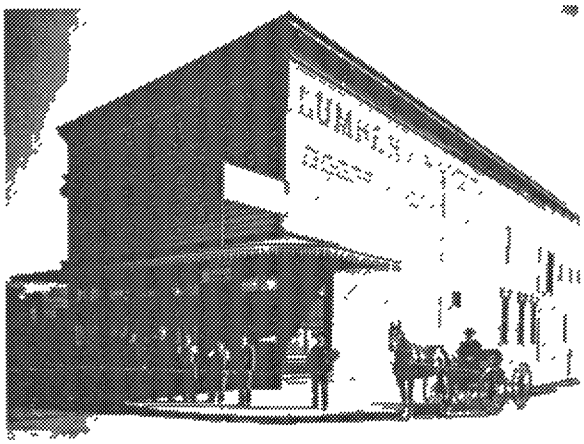
SCALE 0 160 320 FEET

1/4" = 40'

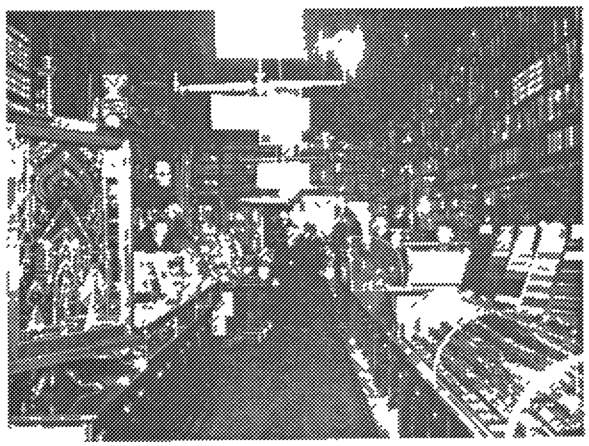
LEGEND:
- ● SOIL SAMPLING LOCATIONS (ERM WEST)
- ◇ MONITORING WELLS (ERM WEST)
- ✱ SOIL SAMPLING LOCATIONS (BASELINE)

BASELINE

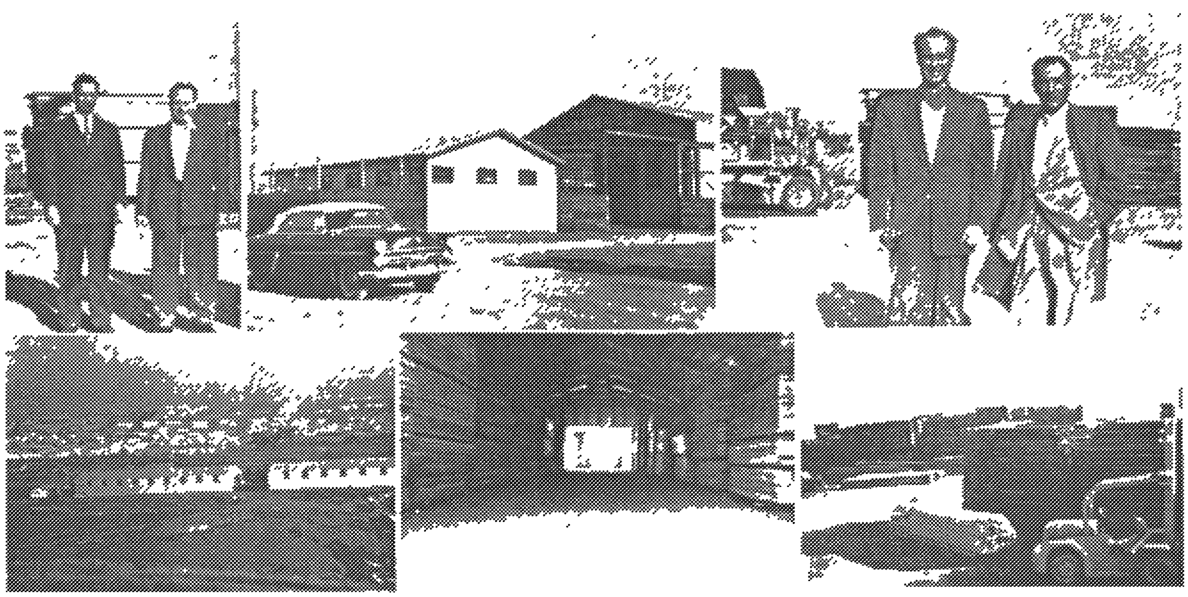
Ricci & Kruse Opens Yard No. 2 for Expansion Need



THE J. H. KRUSE LUMBER COMPANY before the turn of the century. Founded in [illegible] by Mr. Kruse, [illegible] bought out the Kruse interests in 1946 and still maintain Yard No. 1 at this same location, [illegible] Street.



THE GRAND DADDY OF [illegible]



ENTRANCE TO NEW RICCI & KRUSE No. 2 yard at [illegible] Street and Armstrong Ave. in San Francisco (top center). [illegible] of the R&K operation are [illegible] and [illegible] (top left) and [illegible] (top right). New storage sheds (bottom left), [illegible] sq. ft. storage area (center) and yard stock [illegible]

Reprinted from The California Lumber Merchant, February 1, 1956

time the yard was well among one of the oldest in Northern California, having been established in the year 1875 by J. H. Kruse at the Shotwell Street address. The J. H. Kruse Lumber Company grew from its modest beginning and has been responsible for supplying much of the material that went into the building and, after the quake, the rebuilding of the City by the Golden Gate.

After taking over the business in 1946, J. Ricci, who had formerly been many years with the Allen & Dettman Lumber Company in San Francisco, continued to expand the pioneer firm as a wholesale distributor and lumberyard specializing in KD lumber of all kinds. The 1½-acre Shotwell Street yard will continue to be utilized for storage, and the new 3-acre Yard No. 2, with over 35,000 sq. ft. of under-cover storage, testifies to the growth of the firm under Ricci's capable management.

The material expansion of Ricci & Kruse Lumber Company has also been paralleled by a sales and office force expansion. Now assisting Ricci in the buying and selling of lumber is Harold Roberts, who came to the firm a few years back from Winton Lumber Sales Company. Ross Lee, formerly a long-time Van Arsdale-Harris Lumber Company salesman, is now in charge of expediting, and also handles sales for Ricci & Kruse. Overseeing the office management and detail is Vincent Ferguson, associated for many years with the Ricci & Kruse company. Bill Talbot and Charlie Larson, both with many years of lumber handling and yard operation experience to their credit, are in charge of the operation of the two Ricci & Kruse yards.

In line with his expansion program, J. Ricci noted, "Our establishment of Yard No. 2 has greatly improved our operating area and efficiency in enabling us to carry a larger and more diversified stock to better service our customers. In addition, future plans call for increased under-cover storage area and, eventually, the installation of dry kiln facilities."

MASON TILLMAN
ASSOCIATES

RICCI AND KRUSE LUMBER COMPANY

San Francisco, California

SITE HISTORY REPORT

June 1986

2955 Avalon Avenue • Berkeley, California 94705 • (415) 549-0582
P.O. Box 17146 • Huntsville, Alabama 35810 • (205) 533-5418

Ref. #39

TABLE OF CONTENTS

LIST OF PLATES

INTRODUCTION

In order to comply with a pending San Francisco Ordinance, Article 20 Analyzing the Soil for Hazardous Waste, Ricci and Kruse Lumber Company retained Mason Tillman Associates to prepare a site history of the land on which their lumbner company is located. The project site encompasses two blocks immediately north of Armstrong Avenue, between Ingalls and Griffith Streets in San Francisco, California as shown on Plate 1. The project site is also located just south of Hunters Point on the western shore of the South Basin of the San Francisco Bay.

Development of the site history involved a systematic review of documentary material, visual examination of the site and an interview with one of the present owners of the property. Documentary material used in this study was obtained from the University of California at Berkeley's Bancroft Library, Boalt Hall Law Library and Doe Library Map Room; the San Francisco Public Library's Periodical and San Francisco History Rooms; and the library of Mason Tillman Associates in Berkeley, California.

The purpose of the site history was to determine the likelihood of potentially significant hazardous

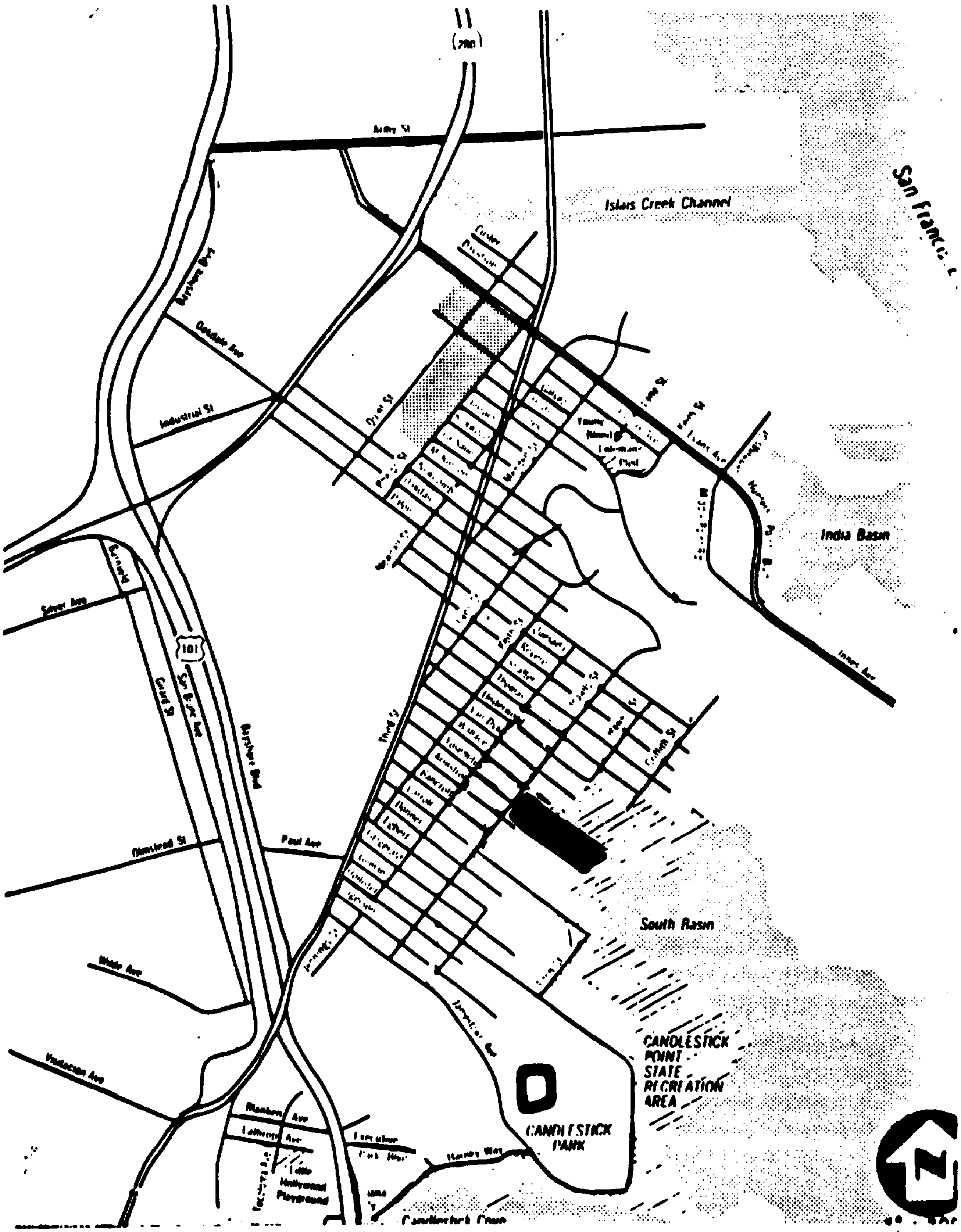


Plate 1.
Site Location Map

materials being within the project site. Mason Tillman Associates' review of the documentary evidence disclosed neither evidence nor any other indication of hazardous wastes on the project site. Further, there is no history of any activity on the land which would have produced hazardous wastes. This site history was not designed to address and does not rely upon such detailed investigative techniques as "preliminary site assessment" or "site characterization." The use of such technical investigative methods is beyond the charge to Mason Tillman Associates for preparing this site history.

Defining Hazardous Waste

In order to discuss this complex subject, it is necessary to state what is encompassed within the term "hazardous waste." When members of the public think of "hazardous waste," they usually envision such events as Love Canal, corrosive material spilled on freeways from tanker trucks, railroad tank cars exploding after derailment and other such dramatic occurrances.

For the purpose of this site history, we have adopted the definition of "hazardous waste" used in the pending San Francisco Ordinance. This definition is set forth with particularity in the California Administrative Code and the California Health and Safety Code. Section 6680 of Title 22 of the California Administrative Code defines hazardous waste as follows:

> " Hazardous waste means a waste or combination of wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may either:
>
> (A) Cause, or significantly contribute to an increase in serious irreversible or incapacitating reversible illness.
>
> (B) Pose a substantial present or potential hazard to human health or environment when improperly treated, stored, transported, or disposed of, or otherwise managed.
>
> Unless expressly provided otherwise, the term 'hazardous waste' shall be understood to also include extremely hazardous waste."

Beyond the issue of definitions, one must seek to determine the characteristics or aspects which make a particular waste product hazardous. According to the U.S. Environmetal Protection Agency a substance or product is considered hazardous if it is found to possess any one of the following characteristics:

> Bioconcentrative wastes: contain lead, cadmium, mercury or polycholorinated biphenyls (PCBs) and are not readily expelled by living organisms and are considered to be bioconcentrative. Such waste would not really come from industrial operations involving the use of these materials.

Toxic wastes: affect the living organisms either by ingestion through the food chain, respiratory system, or through the surface of the skin. Degrees of toxicity, of course, vary. Some forms of toxic wastes are not initially toxic, or at least do not appear to be so, but may become toxic or may manifest their toxicity after repeated exposure with the ultimate destruction of the organism.

Flammable wastes: cause damage directly, from heat and smoke production or indirectly by providing a vector by which hazardous waste could be dispersed. Any waste that is considered flammable under standards promulgated by the National Fire Protection Association.

Explosive wastes: any material which has the possibility of explosive, with or without an external source of ignition, when stored in a nonpressurized container.

Reactive wastes: tend to react vigorously with air or water, to explode or generate toxic gases.

Irritating or sensitizing wastes: come under the toxic waste heading but might not be toxic in the sense that they will cause permanent damage. They may, however, be irritating to the eyes, the skin, or the respiratory system when in contact.

Corrosive wastes: cause damage to human organisms or property by rapid oxidation of the material with which it comes in contact.

Radioactive wastes: emits neutrons, alpha, beta or gamma radiation due to nuclear decay.

California Health and Safety Code Section 25117 provides a list of the scientific names of hazardous wastes and the common names of numerous toxics referenced in the pending San Francisco Ordinance. The list is attached hereto as Appendix A.

Activities Commonly Associated with Hazardous Waste

Hazardous wastes are generated by nearly all segments of industry, by hospitals, research laboratories and government entities (Governor's Office of Appropriate Technology, 1981). By far industry is the largest single source of hazardous waste in the United States, generating this material, in the production of motor vehicles, fuels, paper, plastic, clothing, rubber, paint, pesticides and various petroleum products commonly used in our daily lives. About one-tenth of all industrial waste in the United States is classified as hazardous. Industries generating the bulk of hazardous waste are involved with the production of organic chemicals, textiles, petroleum based fuels, rubber, and plastics.

The largest single high-priority class of waste is toxic metal waste which comprises 20% of California's total volume of hazardous wastes and 54% of high priority wastes. PCBs (polychlorinated biphenyls) are the smallest class and constitute only 0.15% of the State's total harzardous waste production, and 0.25% of the total high-priority hazardous waste (United States Environmental Protection Agency, 1984).

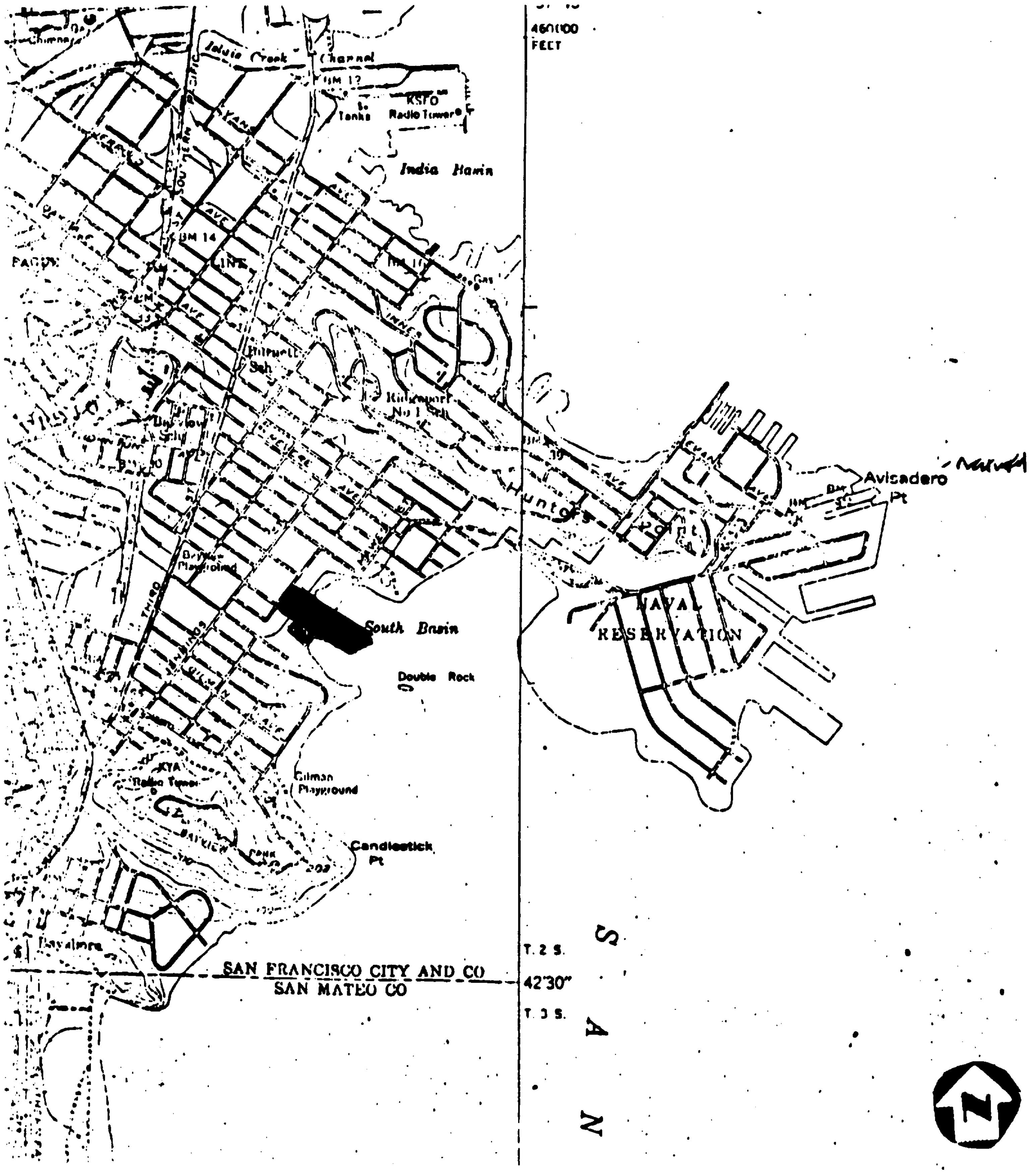


Plate 2.
United States Geological Survey Map, 1955

In examining the project area for indications of hazardous waste, Mason Tillman Associates researched (1) the two block project site and (2) the impact area, a one block radius bordering the project site. In order to best describe the activities which occurred on and around the project site, the development is discussed in terms of three historical periods: Pre-Industrial Hunters Point, Development of Hunters Point, and Modern Hunters Point. An evaluation of the hazardous waste potential for these three periods in Hunters Point developmental history follows.

PRE-INDUSTRIAL HUNTERS POINT (1840-1940)

Project Site Hazardous Waste Potential

Throughout this period the entire project site was under water. There are no known activities or hazardous wastes associated with the shoreline along its eastern border.

The land known as Hunters Point, detailed in Plate 2, remained relatively undisturbed by humans until 1860. In the early 1860s, the South San Francisco Homestead and Railroad Association purchased approximately 2,455 acres of land at Hunters Point from the State of California. The South San Francisco Homestead and Railroad Association planned to develop Hunters Point as a residential suburb of San Francisco. According to Dow (1973) this real estate venture failed "because in the 1850s and 60s Hunters Point was too remote from the City of San Francisco to become a suburb, yet too near to develop into a city by itself." For nearly nine decades thereafter, there were no other major efforts to develop the area.

Some minor development, however, did take place on Hunters Point between 1860 and 1940 after the passage of an 1868 Act allowing filling of salt marshes and tidelands for public and private development. In 1868, for example, the California Dry Dock Company developed its first dry dock on the tip of Hunters Point. In 1903 this same company, which had earlier changed its name to the San Francisco Dry Docking Company, built a second dry dock. Both docks were purchased by the Bethlehem Steel Company in 1908 for use as part of a ship repair facility.

In the 1930s with the growing threat of war, the Navy became interested in purchasing a piece of land suitable for construction of a dry dock near the Pacific Ocean, and Hunters Point was selected for that purpose. On November 12, 1940 the United States Navy purchased

48.6 acres of land known as Hunters Point from the Bethlehem Steel Company for $3,993,572.00 and immediately leased the land back to Bethlehem Steel.

EARLY DEVELOPMENT OF HUNTERS POINT (1940 - 1956)

Project Site Hazardous Waste Potential

The project site was under water until 1955, and there were no improvements in the impact area before 1955, nor evidence or other indications that hazardous waste was deposited on the site before it was filled. There is no apparent reason to believe that the filling of the project site or the development of the surrounding area between 1940 and 1956 would have caused hazardous wastes to be deposited on the project site. The rock and soil used to fill the project site came from nearby Avisadero hill, which had not been developed. Therefore the initial fill of the project site was presumably clean and non-hazardous.

Significant development began at Hunters Point in 1941. After the United States entered World War II, the Navy's interest in Hunters Point changed dramatically. The Navy took possession of the land leased to Bethlehem Steel, and through condemnation, began to acquire additional land in the immediate area. By 1941 construction of a naval shipyard was underway on the Hunters Point Peninsula.

In the early 1950s after World War II, the Navy undertook a major expansion of the Hunters Point Naval Dry Dock, involving reclamation of substantial Bay marsh and tidelands. The Navy leveled Point Avisadero, a 170 foot hill on the tip of the Hunters Point Peninsula, in order to fill the San Francisco Bay in the area around Hunter's Point. The Navy's land-fill effort as shown on Plate 3, filled in the project site by 1956. The original shoreline and fill area are pictured in Plate 4.

Although there was substantial development on the Hunters Point Peninsula between 1940 and 1956, the project site remained under water until 1955 when the Navy's land-fill effort was undertaken. Most of the land in the vicinity of the project site, a relatively undeveloped area of San Francisco, remained vacant. However a few businesses were established during the first quarter of the century, some two to three blocks outside the project area. The Lucatex Paint, Inc. shown on the 1914 Sanborn Insurance Map at 1449 Carroll, was three blocks from the project site. It was present at that site until the mid-nineteen thirties (Polk's San

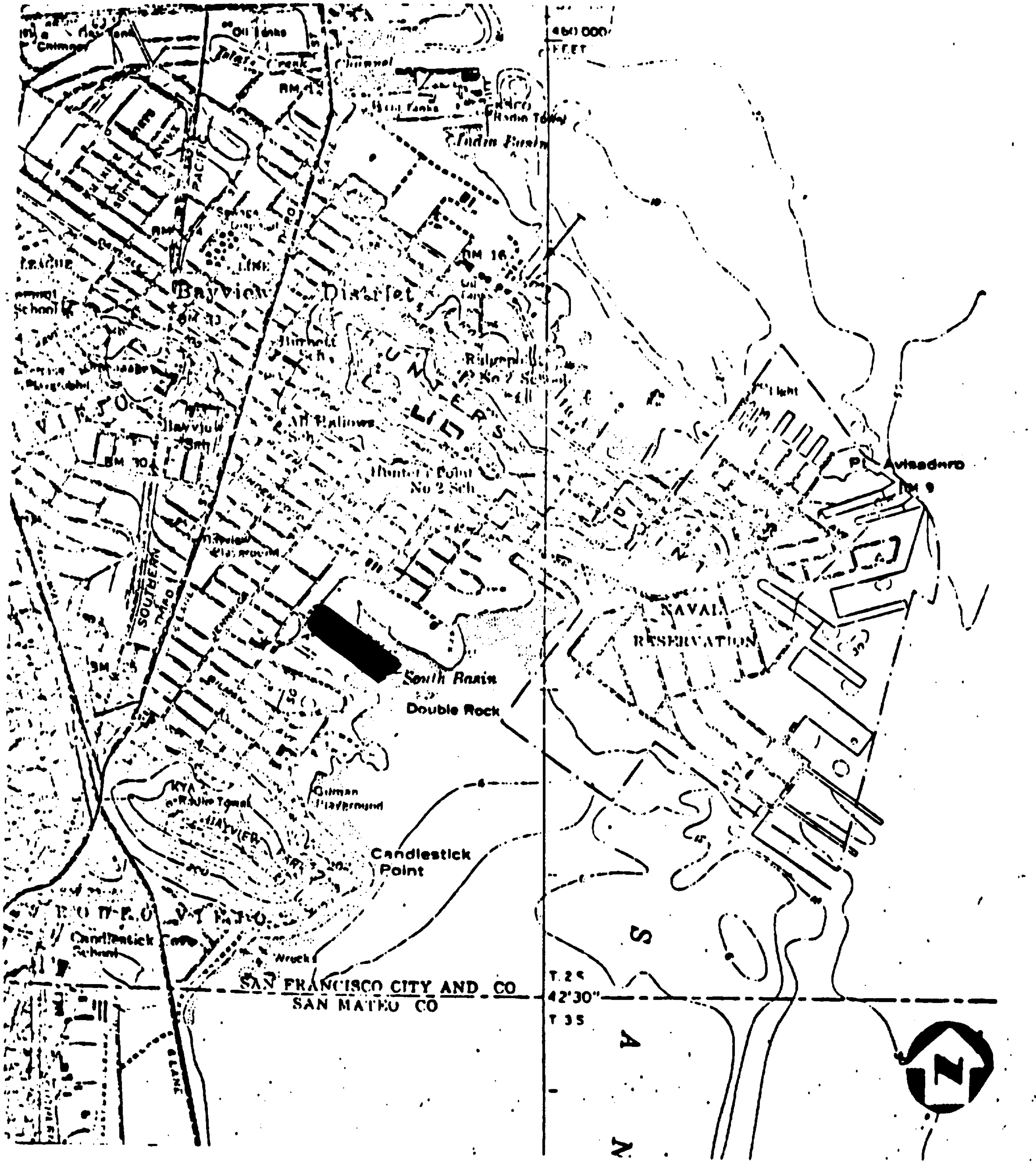


Plate 3.
United States Geological Survey Map, 1956

Francisco City Directory, 1939). Pacific Construction Company, located two blocks from the site at first appears on the 1908 Sanborn Insurance Map. The Sanborn shows it on the same lot until the nineteen sixties.

THE MODERN ERA (1956-1986)

Project Site Hazardous Waste Potential

The Ricci and Kruse Lumber Company has been in the retail business selling various types of woods and related materials on the project site since the mid 1950s. Research failed to disclose any operation on this site by Ricci and Kruse Lumber Company which would have created or produced hazardous wastes.

The project site was acquired by Ricci and Kruse Lumber Company immediately after the land was brought above water. The lumber company used red rock fill to further raise the land level along the perimeters of the project site, ultimately bringing the entire project site to the original shore line. Ricci and Kruse have been the sole and only occupants of the property since it was filled above the water level.

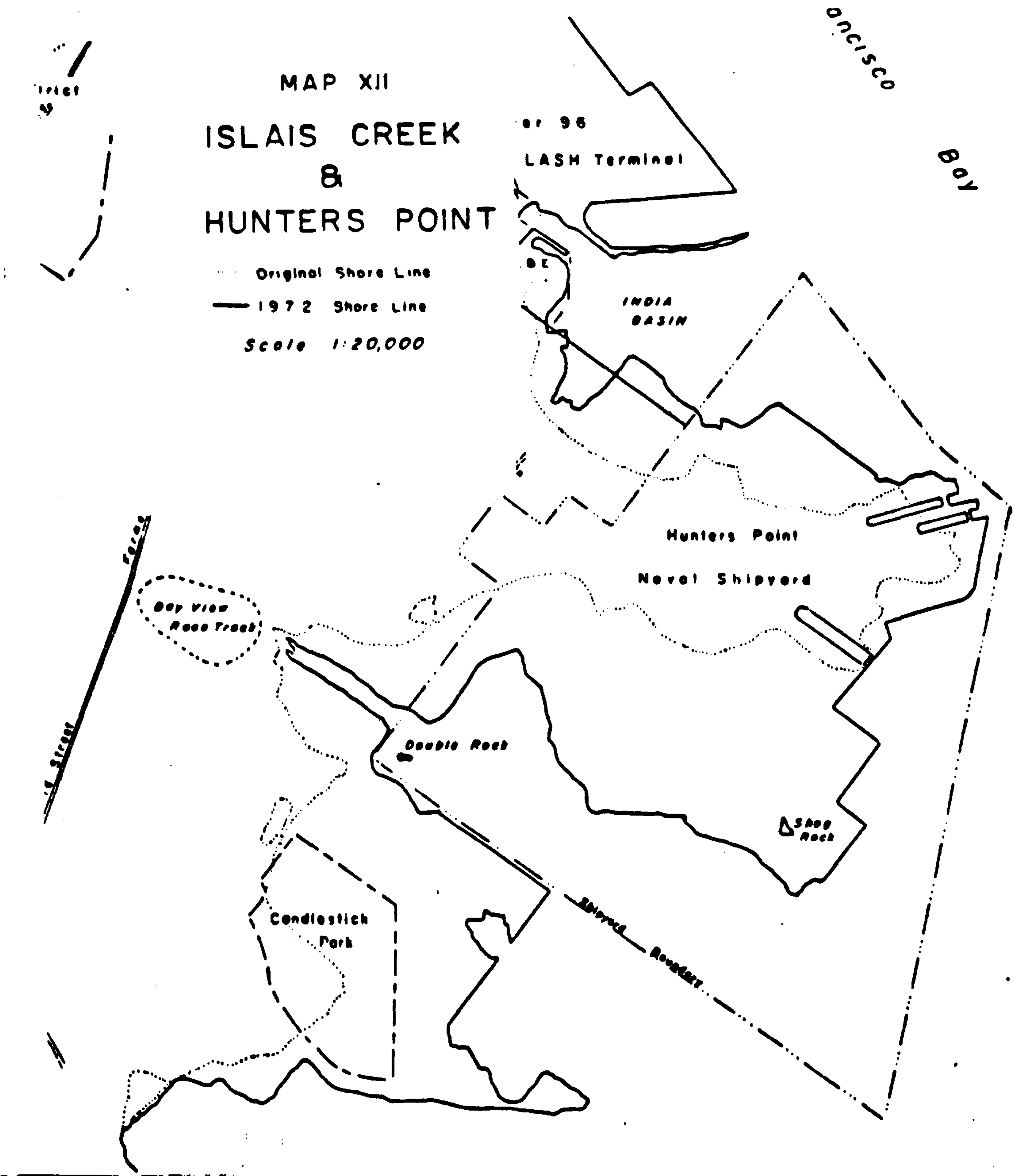


Plate 4.
Map of Islais Creek and Hunters Point, 1973

ALTERNATIVE AREAS OF HAZARDOUS WASTE

The above discussion makes it quite clear that there is virtually no likelihood that any activity on the project site or in the impact area contaminated the project site. Nevertheless, an abundance of caution requires that some comment be made concerning activities within nearby areas. There were activities in the immediate vicinity of the project site and approximately one and one-half miles away, which could possibly present an issue of contamination. The Lucatex Paint, Inc. and Pacific Construction Company (mentioned earlier) present a possible issue concerning hazardous waste contamination as does the Hunters Point Naval Shipyard.

Each of the above mentioned companies could have produced some form of hazardous waste. The types of hazardous waste commonly found in such industrial operations would be in the form of solvents such as paint and cleaning compounds and lead contamination. However, no evidence has been found which indicates that the activities of Pacific Construction Company or Lucatex Paint, Inc. contaminated the project area. Because these two companies were two and three blocks, respectively, from the project site and engaged in no known activities on the project site, it is highly unlikely that either of them would have contaminated the project area.

The Hunters Point Naval Shipyard is one of several Bay Area military installations that has been identified as having hazardous waste problems (The Oakland Tribune, May 18, 1986). There is no evidence that the Naval Shipyard, located one and one-half miles away from the project site, ever dumped wastes on the project site or that contaminants reached the ground water and migrated to the Bay. However, the Naval Shipyard was involved in substantial metal work, electroplating being the significant example that produces hazardous wastes. In electroplating, steel is dipped in an acid bath which often causes acid spills, thereby producing hazardous wastes. Metal contamination is another form of hazardous waste often found in naval shipyards. Solvent contaminated waste is also created from the solutions used for cleaning.

The location of dry docks at the Naval Shipyard also presents a remote possibility of hazardous waste contamination. When water is pumped from a ship in dry dock, that waste water sometimes contains hazardous materials collected in the ships hull. Also, since an immense amount of fuel is used for transportation in a naval shipyard, it is not uncommon to find hazardous waste in the form of fuel spills and waste oil.

For pollution of the project site to have directly resulted from the Naval Shipyard (or the dry dock facility at the Naval Shipyard), the contaminants would have had to travel up to one and one-half miles through air or water to reach the project site. Therefore the likelihood of hazardous materials from this installation contaminating the project site is remote.

REGULATORY REQUIREMENTS

The pending Ordinance, Article 20, Analyzing the Soil for Hazardous Wastes, requires the filing of a copy of the Site History Report with the Director of Public Works, the Director of Public Health and a certified laboratory. A State of California registered or certified professional geologist, civil engineer, or engineering geologist or a certified laboratory must take soil samples from the property and analyze them to determine the presence of hazardous waste in the soil. Completion of a site history and soils analysis are building permit requirements under the pending Ordinance.

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MAPS

Sanborn Fire Insurance Company Map,1914

Sanborn Fire Insurance Company Map,1964

United States Geological Survey Map,1950

United States Geological Survey Map,1955

United States Geological Survey Map,1956

Islais Creek and Hunters Point, from Dow, 1973

INTERVIEWS

Mr. Reg Ricci, an owner of Ricci & Kruse Lumber Company, May, 1986.